NOTE

This Microfiche meets the quality requirements of the American National Standard for Microfiche of Documents (ANSI PH5.9-1975). However, because of imperfections in the document from which it was made, it contains images that are illegible or difficult to read. The source document for this microfiche is the best copy that could be obtained prior to filming.

Congressional Information Service, Inc.
Washington, D.C.

STATE AND LOCAL ECONOMIC DEVELOPMENT EFFORTS

HEARING

BEFORE THE

SUBCOMMITTEE ON TRADE, PRODUCTIVITY, AND ECONOMIC GROWTH

OF THE

JOINT ECONOMIC COMMITTEE

CONGRESS OF THE UNITED STATES

NINETY-SEVENTH CONGRESS

SECOND SESSION

MARCH 22, 1982

Printed for the use of the Joint Economic Committee

U.S. GOVERNMENT PRINTING OFFICE
96-832 O WASHINGTON : 1982

J84149

JOINT ECONOMIC COMMITTEE

(Created pursuant to sec. 5(a) of Public Law 304, 79th Congress)

HOUSE OF REPRESENTATIVES	SENATE
HENRY S. REUSS, Wisconsin, *Chairman*	ROGER W. JEPSEN, Iowa, *Vice Chairman*
RICHARD BOLLING, Missouri	WILLIAM V. ROTH, JR., Delaware
LEE H. HAMILTON, Indiana	JAMES ABDNOR, South Dakota
GILLIS W. LONG, Louisiana	STEVEN D. SYMMS, Idaho
PARREN J. MITCHELL, Maryland	PAULA HAWKINS, Florida
FREDERICK W. RICHMOND, New York	MACK MATTINGLY, Georgia
CLARENCE J. BROWN, Ohio	LLOYD BENTSEN, Texas
MARGARET M. HECKLER, Massachusetts	WILLIAM PROXMIRE, Wisconsin
JOHN H. ROUSSELOT, California	EDWARD M. KENNEDY, Massachusetts
CHALMERS P. WYLIE, Ohio	PAUL S. SARBANES, Maryland

JAMES K. GALBRAITH, *Executive Director*
BRUCE R. BARTLETT, *Deputy Director*

SUBCOMMITTEE ON TRADE, PRODUCTIVITY, AND ECONOMIC GROWTH

SENATE	HOUSE OF REPRESENTATIVES
WILLIAM V. ROTH, JR., Delaware, *Chairman*	CLARENCE J. BROWN, Ohio, *Vice Chairman*
JAMES ABDNOR, South Dakota	JOHN H. ROUSSELOT, California
EDWARD M. KENNEDY, Massachusetts	PARREN J. MITCHELL, Maryland
WILLIAM PROXMIRE, Wisconsin	FREDERICK W. RICHMOND, New York

CONTENTS

WITNESSES AND STATEMENTS

MONDAY, MARCH 22, 1982

	Page
Brown, Hon. Clarence J., vice chairman of the Subcommittee on Trade, Productivity, and Economic Growth: Opening statement	1
Pearson, Paul, president, Miami University, Oxford, Ohio	3
Winkler, Henry R., president, University of Cincinnati, Cincinnati, Ohio	5
Ping, Charles J., president, Ohio University, Athens, Ohio	7
Meyer, Clifford R., president and chief operating officer, Cincinnati Milacron, Inc., Cincinnati, Ohio, accompanied by Robert C. Bevis, vice president, human resources	17
Farrell, Robert M., vice chairman, Structural Dynamics Research Corp. (SDRC), Milford, Ohio	21
Foley, Howard P., president, Massachusetts High Technology Council, Inc., Boston, Mass	24
Dix, T. J., president, DX Financial, Inc., Cincinnati, Ohio	40
Grieme, Ralph B., Jr., industrial development consultant to the city of Cincinnati, Ohio	51

SUBMISSIONS FOR THE RECORD

MONDAY, MARCH 22, 1982

Dix, T. J.: Prepared statement, together with an attachment	44
Murray, Walter R., Jr., assistant to the president, Cincinnati Technical College, Cincinnati, Ohio: Statement of	63

STATE AND LOCAL ECONOMIC DEVELOPMENT EFFORTS

MONDAY, MARCH 22, 1982

CONGRESS OF THE UNITED STATES,
SUBCOMMITTEE ON TRADE, PRODUCTIVITY,
AND ECONOMIC GROWTH
OF THE JOINT ECONOMIC COMMITTEE,
Washington, D.C.

The subcommittee met, pursuant to notice, at 10:30 a.m., in the City Hall Council Chambers, Cincinnati, Ohio, Hon. Clarence J. Brown (vice chairman of the subcommittee) presiding.

Present: Representative Brown.

Also present: Richard Vedder, professional staff member.

OPENING STATEMENT OF REPRESENTATIVE BROWN, VICE CHAIRMAN

Representative BROWN. I call the subcommittee to order.

This subcommittee hearing is another in a series on State and local economic development efforts. Though the subcommittee has had a decade long interest in this issue, it has never been more keen than today. The ineffectiveness of the Federal Government to adequately address our economic problems, the dramatic turn by voters in 1980 away from Washington, and the efforts of the Reagan administration to provide more local control in a variety of economic areas have placed State and local development efforts in the limelight.

Unlike past decades, the economic future of this country mostly will be determined by how cities and States respond to their local economic problems and not by the churning of economic policies in Washington. This is an opportunity for citizens to have a greater control of their destinies, but it is also a dead-eyed challenge that removes the protection of a Federal bailout of city and regional failures.

Noting these changes, many so-called experts have determined that Ohio and Cincinnati will be losers in this last part of the 20th century. Just last year, the Bureau of Economic Analysis of the U.S. Department of Commerce predicted that Ohio employment would grow at approximately one-half the rate of the United States between now and the year 2000—though Cincinnati, by these projections, will grow the fastest of any major Ohio city, it will fare only slightly better.

These economic projections for the next two decades are particularly suspect because of the return of power to local and State governments that is just now beginning. If citizens, together with their elected officials, gain control of their economic futures and reasoned programs and policies, Cincinnati, Ohio, the Midwest and the North-

east will be extremely prosperous once again. And doing so will make the country economically strong again because this part of the country is the guts of its economic output.

The subcommittee is in Cincinnati today to measure the progress of the Queen City in high technology development.

What makes Cincinnati of great interest to the subcommittee is that it has a high degree of advanced and new technology development in place. We are anxious to hear from two high technology companies that are leading the world in their fields.

We are also extremely interested in what efforts Cincinnati is making to expand high technology development with particular interest in attempts to better utilize the resources of universities in economic development.

Also, we are pleased to have a witness to discuss high technology progress in Massachusetts—a State that has reversed its economic fortunes in relatively short order.

In addition, as we all know, any business development needs financing. Because of the nature of new technology research and application, investment risks are very high. Consequently, discussion of venture capital markets is quite necessary.

There are many who say that there is no venture capital available for the entrepreneur, and there are many who say it is out there, but you have to know how to get it. Certainly any community interested in developing its high technology sector must expand the venture capital market it can tap.

One other thing must be said regarding technology growth: The rise of high technology industries does not threaten existing jobs or companies. In fact, because of the explosion of technical knowledge in the world, all industry, whether old or new, depends to an increasing degree on science and technology for survival and growth.

The high technology jobs are not a replacement of present jobs but augment and secure jobs already in the community. The days of fear of science and technology must end, and we must enter a new day where we use science and technology to improve our futures.

This hearing emerges out of a strong belief that I have had for many years that this region, like other regions throughout the manufacturing belt, possesses the educational, cultural and scientific resources to command a leadership role in the high technology industries in the 1980's and beyond. To the extent that this subcommittee is successful in providing a greater public understanding of the complex issue of technology transfer and the linkage between technology development and growth, it will have served a high purpose for the subcommittee, the Congress, and the country.

This is a part of a series of studies that has been going on as noted for some time.

We have been in a number of cities around the United States and a number of cities in the Midwest and Ohio, in particular, because of the problems which our State and this region seem to have that are peculiar to this economic time.

One of the things that I learned when I was a young man in college was that Cincinnati made it through the depression with less damage to its economy than had been the case with many other major industrial cities in the country at that time.

The reason was because it was a very diversified community and, therefore, while some parts of it were adversely affected, other parts of it were benefited by the economics of the day.

So that balance made Cincinnati prosper more than some other communities during a very difficult time. Now it is our hope that we can discover that Cincinnati is prospering or will prosper from the technology development that can go on in this community.

It is clear, at least that in the Ohio scene, Cincinnati is not adversely affected as some of the other cities where we have had hearings. Youngstown, Dayton, and Toledo are the three examples.

We will start our hearing this morning with three of the distinguished presidents of major universities in the area: The University of Cincinnati, Miami University, and Ohio University.

Gentlemen, I think we will let you each make your presentation and then, to the extent that there are questions, we will ask you all to respond to questions at the same time.

We will start with Paul Pearson, the new president of Miami University.

Mr. Pearson, please proceed.

STATEMENT OF PAUL PEARSON, PRESIDENT, MIAMI UNIVERSITY, OXFORD, OHIO

Mr. PEARSON. Thank you, sir. It is a pleasure to be here and to have the opportunity to testify on something that I feel is extremely important for the economy of the State of Ohio.

It is my major thesis that the improvement of the economy of Ohio is dependent, upon other things, upon an improvement of our higher education system and upon improving the relationships between universities and business and industry.

I am a scientist, a zoologist, and ecologist who has had experience dealing with the real world of interaction between universities and business and industry. I strongly believe that there are three major functions at quality universities that serve to attract and aid the development of high technology industries. They are as follows:

First, the education of the future leaders in research, business, and commerce. The evidence shows, and the record is clear, that persons educated in the region by and large tend to stay in that region so that the Ohio institutions are, in fact, honing the skills, they are educating the leaders upon which the industry of this State will depend in the decades ahead.

Further, these quality higher educational institutions provide talented instruction for the continuing education and the professional upgrading of employees in these particular industries so that the early education and the continuing education of the people in industry provides manpower to make these operations profitable.

Second, quality institutions of education provide the ideas, the inventions, and the creative reorganizing of old ways of doing business. In short, one of the major products of quality universities is the production of raw materials for new ventures and for improvement in productivity and the quality of the products produced in industry.

Third, a very important function of the universities, and one not to be ignored, is the provision of the culture base for a region—the

music, theater, lectures, and lively debate of visiting scholars. All of this adds a broad cultural component that serves an important function in attracting industries to a region and in entertaining and enlightening the employees of those industries.

Miami University in Oxford, Ohio, has an excellent reputation in providing these three functions, for we have the products of Miami University in business and industries, including high-tech industries in this region and in the Nation, from lower positions all the way to the top executive management of these corporations.

So you ask what is needed? I think there are several things that are needed.

First, I think a stimulus from a subcommittee such as this one is needed to bring together a small group, an elite group if you will, of decisionmakers, leaders from business, industry, universities, and government, to provide an action oriented planning organization, a directing unit that can bring together industry, business, and universities to plan in a coherent way for target goals for a particular region.

We can learn very well, I think, from the work of the "Silicon Valley" in California, where they purposely went after a particular industry, or the "Research Triangle" in North Carolina. I would propose that this small, action-oriented group of leaders for the Miami Valley come together and plan for those types of high-tech industries which would do well here and for which there is a great need.

Second, there is need from State and Federal Government, as well as from private interests, to support the development of stronger research and development facilities at our universities.

This can be done through the efforts of State or Federal Government in providing incentives for cooperative efforts between industry and universities and in providing necessary manpower that can aid in the completion of efforts favorable to the high-tech industries.

I am a newcomer in the State of Ohio, but after 9 months and a good deal of study and hard work, I have come to the conclusion that Ohio has an excellent reputation in the support of constructing buildings, but there has been a significant failure by the State of Ohio adequately to support personnel and the programs that fill those buildings.

We currently have in the State a fiscal crisis, as in many of the industries of the State.

I am interested to note that, with the approach of this crisis, one of the biggest targets for cutting was higher education. This says to me that the leaders of this State have not realized the critical importance of an investment in higher education for the future well-being of the industry, business, and commerce of this State.

Third, I believe that we need to take a very hard look at the support for graduate professional education at our universities. Currently we have a debate going on in our country concerning the provision of loans to support the graduate and professional education of young men and women in this country. The proposal that is currently being debated is to eliminate all Federal loan support for this program. In my judgment, this would be a tragedy because what it would do is remove a resource, a human resource, that will benefit the State and the Nation in the decades ahead through their advancement, their knowledge, and their high state of learning. It is extremely important

to provide the quality, to provide the increased productivity, to provide the incentive for the kind of industrial and business development that is needed for the economy of our Nation. Thank you, sir.

Representative BROWN. Mr. Pearson, thank you very much. We appreciate your testimony, and we will go to the testimony of Henry Winkler, president of the University of Cincinnati.

STATEMENT OF HENRY R. WINKLER, PRESIDENT, UNIVERSITY OF CINCINNATI, CINCINNATI, OHIO

Mr. WINKLER. Thank you, sir. There has been much concern of late over the fact that as a nation we are losing our competitive edge. Declining productivity, an unfavorable balance of trade, and an economy in turmoil are only a few of the indicators that remind us quite dramatically that we must do something to address this situation or run the risk of being unable to regain the prominence that so many in this country worked so hard to achieve.

I don't think there has been any reduction in our national willingness to work hard, but I think the solutions to our current problems are going to require more than that. They are going to require new approaches and increased cooperation among all sectors of society—especially government, private enterprise, and education.

One area where this cooperation is needed is in seeing that members of the work force are prepared to meet the changes that face them in the modern day workplace.

As job requirements change and the demands on workers become increasingly complex, many people find themselves ill-equipped to deal with these changes and fall victim to unemployment. The irony is that while many individuals are unemployed, many businesses and industries are experiencing a shortage of qualified employees.

Some issues need to be faced in this regard. It is questionable, for instance, whether business has been sufficiently sensitive to the need for upgrading and retraining an aging and shifting work force. And it is certain that faculty preparation for working with an adult population is still in its infancy.

Men and women in midcareer who come seeking new skills, broader perspectives, fresh information cannot be taught as though they were young people of 17 to 21, devoting full time to oncampus studies.

We in business and in higher education need to talk more systematically with one another about the kinds of teaching—and teachers—required to do a job that is quite different from the standard models in all of our colleges and universities today.

Of course, many universities, the University of Cincinnati included, have substantial commitments to continuing education, but more needs to be done, especially of a cooperative nature. We need to find ways and means to seek incentives for the development of joint ventures, primarily at the local level, to address the whole question of the constant and recurring upgrading of our national work force—the unskilled and semiskilled no less than the managers and technicians who come in the first instant from our colleges and universities.

This emphasis on continuing education, however, must not be at the expense of our other educational endeavors. There is still the need

to provide our traditional full-time students with the education and experience necessary to enable them to meet the demands of modern society. Our extremely effective method of doing this is the cooperative education program, that blend of learning and doing which got its start in the United States at the University of Cincinnati in 1906.

Cooperative education should be expanded, but to do so requires real and constant commitment in the workplace and on campus. Business managers must be willing to assign the time to teach, not just provide employment for college students; and professional career development personnel must be involved fully in the liaison between faculty and firms if the mode is to work successfully.

A co-op program that is only a way of providing for the costs of an education is worse than useless. A carefully constructed, genuinely cooperative program can pay high dividends for all involved.

Another activity that can pay high dividends is the research that is conducted at universities. Let me emphasize that most university research is not of the type that will provide specific and immediate answers to the problems facing business and industry, but neither is it so esoteric as to be of no use in developing answers to these problems.

A good example can be found in the University of Cincinnati's College of Engineering. Leading industrial planners believe that the introduction of computer-controlled robotic devices into manufacturing processes represents a major hope for arresting and reversing the productivity decline in the United States.

Last year the College of Engineering received a $100,000 grant from the National Science Foundation for basic research in robot dynamics. In addition to advancing knowledge in this field, this research could have potential applications in a number of industries, including automotive, steel, light manufacturing, and energy, to name but a few.

We at the university are exploring with several major industrial firms a greatly expanded cooperative endeavor in this exciting new area.

Reliance on Federal funding for research of this type is not the answer, however. What is needed is a strong three-way partnership involving higher education, private enterprise, and the State government. An arrangement of this sort will enable us to channel our resources and our efforts toward addressing Ohio's most pressing needs.

Again, as Mr. Pearson suggested, North Carolina is a State that has made a great deal of progress in this area and has demonstrated the beneficial effects of such an arrangement.

I am happy to say that Ohio is already moving in this direction, and a Governor's task force, on which the University of Cincinnati is represented, is investigating ways in which this sort of cooperation can be fostered in our State.

Finally, I think it is essential that we be open and candid in our dealings with one another. We need to understand each other's purpose, as well as each other's limitations. We need to talk more thoughtfully with one another about what higher education can do for business and what it can't.

Too often expectations have exceeded reality on one side; claims have exceeded reality on the other. Some kinds of preparation will always be done better in-house by various businesses than on campus:

conversely, some kinds of instruction are wasteful when the business enterprise feels compelled to undertake it on its own.

We have various modes of training and of education, from commercial, profitmaking training enterprises to huge, in-house business educational endeavors to a complex series of college and university programs. Much of what is done, many of us have come to believe, is overlapping, duplicative, essentially wasteful.

We need to work together more effectively in order to be more effective educationally, and ultimately more effective in answering the challenges facing American society today.

Thank you very much, Mr. Vice Chairman, for giving me this opportunity.

Representative BROWN. Thank you, Mr. Winkler.

Our third panelist on the higher education panel is Charles Ping of Ohio University, and Mr. Ping has written rather eloquently on this subject and some others on higher education.

We appreciate you being here this morning, and I know that Richard Vedder, who is staff economist in the Joint Economic Committee, particularly appreciates his attendance because he is a product of your institution, serving there before we snatched him off and took him to Washington.

STATEMENT OF CHARLES J. PING, PRESIDENT, OHIO UNIVERSITY, ATHENS, OHIO

Mr. PING. Thank you, Mr. Vice Chairman. I am grateful for the opportunity to testify before this subcommittee of the Joint Economic Committee on the issues of economic development and the growth of high technology in our region and ways to enhance that growth.

The subject is important to me as a resident of the State of Ohio and as a university president. The economy of Ohio is depressed; unemployment is high; support for education low.

The economy and education are closely tied together. Neither can prosper without the economic health of the other. The economy is fueled by brain power. Adequate support of quality education is dependent upon the economic health of the State and the Nation.

In my testimony, I want to present and briefly defend three assertions and to offer three proposals for review. The three assertions are:

One, intellectual capital is the critical input for reindustrialization and the high technology which is the focus of this hearing;

Two, university research is a basic stimulus to productivity and economic growth; and

Three, joint ventures between universities and businesses are a key to the economic future of this State and region.

The three proposals focus on financial assistance for students, funding for the future, and incentives for joint ventures.

Intellectual capital is the critical input for reindustrialization. Most of the hue and cry for a "reindustrialized" United States centers around the financial capital required to generate new products and processes, machines and plants, research and development.

Less discussed, but far more important, is the essential human capital. Without trained and developed intelligence and imagination, our

real economic problems cannot be solved, the discoveries made, the work done. To nurture this high level human capital is the business of the university. That business is troubled.

The business of education is human development through instruction, research, and service. This business is troubled by the withdrawal of State and Federal support. What is endangered is not simply institutions; what is endangered is our future.

The former president of the Carnegie Corp. put the issue forcefully when he wrote, "The Nation's fund of high-level intellectual capital, on which it is now so dependent, is far from being a permanent asset. Once acquired, it wastes rapidly if its replenishment is neglected."

Public responsibility for education is not simply a valued tradition of our democracy; it is an absolute requirement for our economic well-being.

University research is a basic stimulus to productivity and economic growth. Rather than analyze this statement in abstract terms, I want to defend the assertion with concrete examples from the life of Ohio Universtiy. The illustrations are by no means unique to one university; they could be replicated on the campus of every major research university in the State. But these are the people and the work I know best.

Peter Griffiths is an analytical chemist in the College of Arts and Sciences at Ohio University. One of his research projects, partially funded by the United States Steel Corp., deals with the analysis of coking coal.

If his techniques of analysis prove reliable, the United States Steel Corp. estimates this work could save that corporation up to $30 million in laboratory costs annually.

Robert Savage, a chemical engineer in our College of Engineering and Technology, is working with a scale size boiler project using a mixture of heavy fuel oil and pulverized coal with a potential of using large quantities of Ohio coal for producing energy in oil-fired burners at about the level of cost for energy for such boilers prior to the first oil embargo.

How important to productivity and economic growth in this State are cost containment and energy costs? How important is the economic health of the coal and steel industries to Ohio? The questions answer themselves.

Far more important than the specific economic and productivity values of such research is the fact that the research is conducted in an educational environment concentrated on the tasks of human development.

It is this fact that ties the first two assertions in my testimony together. Through such activity, the joining of senior and apprentice researchers, we develop the skills, the understanding, the imagination by which we deal with the present and by which we will address the problems of year 2000 and 2010 and beyond.

The third assertion is that joint ventures between universities and businesses are a key to the economic future of this State and the region. Other regions of the country, specifically New England and the West Coast, have already dramatically demonstrated the economic power of such interaction.

The business assessment of the promise is reflected in major investments. Ohio has not been in the forefront of this development. The establishment of research and technology parks is only just begun.

To be a participant requires well equipped university laboratories and people with demonstrated capacity to be productive at the leading edge of scientific and technological research and development.

If we are not presently active, there is, however, potential and documented achievement. Again, rather than defending this assertion in abstract terms I want to put faces on the point using the people of Ohio University to illustrate the potential for joint ventures.

Richard McFarland, professor of electrical engineering and director of our Avionics Engineering Center, manages 12 to 15 projects worth close to $1 million presently. Funds come from Federal sources as well as from the aviation industry to solve problems in instrument landing systems, navigational aids and other aviation equipment for both pilots and airports.

Electrical engineering students, from baccalaureate to doctoral students, vie for 18 internships with Professor McFarland. This work has a problem solving focus dealing with the safety of private aircraft navigation and landing systems, but it also has both service and product potential in this high technology industry. The development of that potential is a challenge for the years ahead.

Thomas Wagner is a young biochemist, 12 years on the Ohio University faculty, whose artistically conceived research, the work of a team involving other faculty and graduate students, resulted in an official report published in the October 1981 issue of the "Proceedings of the National Academy of Science."

What was described in that report was the first transfer of genetic material from one mammalian species to another. The report generated great public interest and was featured in CBS and NBC evening broadcasts and on the front pages of newspapers from coast to coast.

The International Herald Tribune devoted portions of three columns on the front page to the story; the report was highlighted in the London Times, Rome newspapers and elsewhere.

But the point is that this work also generated a pending patent on the process in the name of Ohio University and a contract for the commercial development of the process with the Genetics Engineering Corp. It will likely lead to major developments in the animal breeding industry allowing breeders to speed up the process of selection and to produce stronger and more efficient animals through genetic engineering.

Whether the economic activity will occur is not a question. There is only one unanswered question—can this economic development in an emerging high technology industry contribute to the economic renewal of Ohio?

Finally, I want to place before you briefly three proposals.

The issue of Federal programs of financial assistance to students will be before Congress in the weeks immediately ahead. The recommendations described in President Reagan's budget will cripple graduate and professional education and, therefore, the development of the human capital and the research activity described in the early parts of my testimony. Federal expenditures must be cut, but it is possible to

reduce Federal dollars without destroying the financial aid programs. If, for example, the guaranteed student loan program is based on demonstrated need, Federal dollars will diminish sharply and the much publicized abuses of the program will be eliminated. I urge you, in the interests of economic development, to reject the President's recommendations that graduate and professional students be excluded.

I urge you to continue to allow graduate and professional students to have access to the guaranteed student loan program. With this action, you will have made an important contribution to the growth of high technology in Ohio and elsewhere.

Further, if the program of loans is based on demonstrated need, then to continue the practice of delaying interest until after graduation makes sense. To do anything else mocks the intent of providing assistance to those who cannot pay their way during a period when they are full-time graduate students.

Second, it is imperative that at Federal and State levels we fund for the future. The preoccupation with the requirements of survival funding in the form of funding of defense or welfare needs, when undertaken at the expense of educational needs, will in time destroy our capacity for economic growth and development, higher levels of productivity and technology.

This is more than a matter of perspective—funding for education is the key investment of the State of Ohio and this Nation in the future.

Finally, I think the possibility of effective joint ventures between business and universities has been greatly enhanced by provisions in the 1981 tax laws for incentives for industry to move research activity to campus and to support this activity by investment in projects and equipment.

I commend Congress for this step and urge that the use of the provisions be monitored to insure that there is movement and that an effort be made to increase the incentives if they prove productive.

Economic growth, productivity, university-business joint ventures, limited but effective Federal intervention are descriptive of the enlightened self-interest of all parties. The economy must grow to provide for the material well-being of the people you represent.

The reindustrialization of America is dependent upon the educational processes leading to developed intelligence. Universities will prosper only so far as the economy is strong. Thank you.

Representative BROWN. Mr. Ping, thank you very much for your presentation. I want to pursue a few questions, if I may, with each of you.

The testimony of questions and answers we will make part of our report and will be available to other Members of Congress and, of course, to other members of the subcommittee as we proceed with these hearings around the country.

In North Carolina, 150 top science students attend a special high school for the purpose which is to provide top-flight training for youngsters at that level of education, to encourage and reward their efforts in the sciences, and give them an advantage in going on to college.

The idea behind it is broader than that, however. It both promotes science as a career at the elementary and secondary levels in public

schools in that State, and it also promotes the State of North Carolina as being particularly interested in science.

In contrast, in Ohio, it has been estimated that 36 percent of the top high school science students leave the State to attend college elsewhere.

Are you aware of any program or would you encourage a program to advance science engineering as a career at the high school level in this State, and are we adequately geared to take advantage of an increase in engineering and science students at our public institutions and the institutions of higher learning that are private?

Mr. WINKLER. There are some articulation programs. We have a program whereby people in our college of engineering, starting at about the ninth grade level, go out and talk with students generally in the public high schools, but, I think, beyond that an attempt to interest them in and encourage them in the future of engineering—one of the problems that I think most institutions face, and this is particularly the case with engineering, is that our faculties in those areas are stretched so thin at the present time that it is almost impossible to really contemplate other initiatives and developments for them.

I think you probably know, Congressman, that in the Nation as a whole, there is something on the order of 2,500 professors of engineering or professorships of engineering that are vacant, and this is, of course, part and parcel of the market situation that all of us have faced in that area.

Representative BROWN. Is our percentage in Ohio higher, or lower than the national average?

Mr. WINKLER. I really cannot answer that accurately. Our percentage is very bad.

At my own university, for example, there is a whole series of vacancies and I suspect that the same thing would be true with the other institutions in which there are engineering programs in this State.

We are finding that young bachelor of science or bachelor of engineering graduates that go out into the private sector in the very beginning demand as much of a professor who has been in the university for 11 or 12 years.

Under those circumstances, it is awfully difficult to persuade someone to stay in graduate school to take an advanced degree in order to go into teaching, and that, of course, puts point to what Mr. Ping said about Federal support for graduate education.

It is hard enough to persuade young people to go into these areas. If we aren't going to develop this incentive, it is going to be impossible to do so.

Mr. PEARSON. Mr. Vice Chairman, I would concur with what Mr. Winkler said about the difficulty of hiring faculty today in an economic climate where the resources of people in our State assisted institutions are not adequate to allow us to compete properly with the opportunities for engineers, computer scientists, accountants, biologists—many different types of experts on our campus.

I would also like to speak to the point that you made about elite science high schools. I very strongly support the idea of special high schools for the brightest and the best of our young men and women.

If there are science high schools, that's fine, but as a scientist, I would speak for a very broad and basic education.

In addition to science, I would advocate a very strong background in literature, history, and philosophy, as well as in chemistry and physics and biology.

So I think the breadth of that high school education is as important as the provision for a high school with very, very special people.

As a newcomer to the State, I cannot attest, maybe the others can, to the extent to which we have that in this State, but it is a very important feature in terms of the development of young people for a career.

We at Miami University now have just started a program for the coming summer to interest high school juniors in coming to the campus for college-level credits, to stimulate them to do more, to work harder, and to go into certain of these professions that we are talking about that are important to our region and our country.

Mr. WINKLER. Walnut Hills High School in Cincinnati really fits the bill that Mr. Pearson has been describing.

For decades, many decades, it has been one of the leading high schools in the United States, continues to be. Students come to Walnut Hills exclusively on an examination basis. They come from anywhere in the city, and the program still is a program that is, I find, very impressive indeed.

Representative BROWN. Possible in a metropolitan area, but isn't it somewhat more difficult in rural areas?

Mr. WINKLER. Yes.

Representative BROWN. It seems to me that we have the structure through our centralized joint vocational schools that might offer some opportunity that would even serve the rural area, where if you could focus at the location of that joint vocational school and emphasize science or other courses that would not be available in an area of small communities that do not have the Walnut Hills option——

Mr. WINKLER. I have a strong sense that our 2-year college could be used in this respect as well.

Mr. PING. In response to your first question, I think there are a number of ways in which programs in place address this issue: the effort to draw on campus, during the course of a high school career, exceptional students for summer study, the opportunity for students within a region to take concurrent registration to enrich the high school program; some not-school based programs directly like the recent 19th Annual Ohio Symposium on Science. Together some dozen students in the State of Ohio gathered to present papers in a kind of recognition-reward reinforcement structure.

The second part of your question, can the universities serve their needs well or is there reason for this outmigration of students, I think there is a gap in the State of Ohio and that gap is growing.

We can serve well the brightest and ablest students. I think it is proper to fund people and equipment for programs that will hold that sector, both for the college work and, as Mr. Pearson was pointing out, following their college work to contribute to the growth of this region.

Representative BROWN. Is there something endemic within the financing system of the higher education program in Ohio that limits to certain level academic salaries or the development of excellence in various institutions?

Mr. PING. I think excellence exists surprisingly in a number of instances around the State, but it is clearly not true that resources buy quality.

Quality is dependent upon a lot of factors, judgments being made, and other conditions, but if funding is not a sufficient condition, I think it is a necessary condition.

And I think the basic problem is instructional support. This is a well-worn theme, but when the State finds itself depending upon whether you are using the measure of dollars per student, dollars per personal income in the State, or dollars of dollars in support of higher education, depending on which sets you use, 46, 47, or 48, the finanical base fails to support quality.

Ohio is seriously limited. And if that's the historic problem then the pattern in change is, I think, endemic in even a short period in that in the last 2 years, Ohio has managed to be 50th out of 50 States in the level of improvement of its—or change—in its support of higher education.

Mr. WINKLER. Starting from a very low base.

Mr. PING. Starting from the base 47, 48 on one or more of these measures. Ohio finds itself in change over the last 2 years running absolute last.

Mr. PEARSON. I think that is the point I was making. The State has done very well in providing physical facilities, but it has failed miserably in providing the money for the personnel and operation of the programs that are necessary to create the ideas of the quality education that is required in order to lure high-tech business and industry to this State.

There is a very strong and clear relationship between the quality of education and where industries go. That is well documented in Boston's Research Triangle, in North Carolina, and the Silicon Valley in California, and now there are other States beginning to move.

What Ohio and the leaders of Ohio in the public and the private sectors need to do is decide to make that investment.

Representative BROWN. Let me hit one other point that may be a mainstay for high technology development also, and that is the aggregation of information. The high technology people stress the importance of a good research library available in the State or to the institutions of higher learning in the area.

I know that last year the Dallas Research Library had over 2 million requests just from business for its services.

Have any of you given any thought as to how you would expand the research information in the State of Ohio or in specific areas or your institutions, and does any particular capability already exist? Could expansion of research knowledge be financed by private business since they would be using the library, or is this also a public funding issue?

Mr. PING. Ohio has uniquely been a leader in unified catalog building and process organized handling of material.

The Ohio College Library Association and its mechanisms, is one of the bases on which to build in Ohio in that the technological capabilities transfers references where they are identifying them by access to them exists on paper, but it has not been transferred into the kind of funding to permit there to be an interlocking network drawing upon several universities and their library resources.

Mr. WINKLER. Even there, though, I think a number of us have been very sensitive to the need to build.

Five years ago, my university, for example, was listed as 69th among the major research oriented universities in the country in terms of its expenditure, both for materials and for service in its library system.

Representative BROWN. By which institution?

Mr. WINKLER. The American Association of Research Libraries publishes these figures annually.

This year we are listed at 40. This is the Association of Research Libraries. This year we are listed at 40th.

Now, that means that we have made some very definite decisions about the allocation of resources.

We have felt that library resources are so central to what goes on in the university that we are going to cut back on other programs in order to be able to try to keep up.

No one is keeping up currently, incidentally, with library resources.

Representative BROWN. Because of the general funding cutbacks?

Mr. WINKLER. Not only general funding cutbacks, but the enormous increase of expenditures. Expenditures have gone up 10 to 15 times as their costs have risen.

Mr. PEARSON. I think there is an additional problem, exponential growth in the number of publications so the number of publications has gone up, the cost of publications has gone up, and budgetary support has gone down.

So what that requires is the specialization in different universities, in particular areas, and then the joint linkage of those, as Mr. Ping mentioned, through this Ohio computer library network so that you can share these resources.

That is in place and is being used so that the enhancement of the research library information, I think, is in pretty good shape in Ohio in terms of the base.

Of course, many other things we do need more money for that particular operation.

Representative BROWN. It seems to me that there are other sources of financing higher education and its research and scientific development than either State general funding or student programs, and I would mention just a couple and get your comments on them.

Funded research for Ohio colleges in the Miami Valley, according to Mr. Kegerreis of Wright State University in testimony at a Dayton hearing which we had exceeds that in the "Research Triangle."

So it seems to me that that is one source of research effort, one source of funding—that might be used to benefit the research effort by institutions; Federal funding and the other private institution's funding.

Mr. Ping, you have talked about genetic research.

I was wondering if the firm that you mentioned, Genetics Engineering Corp., was an Ohio firm or an out-of-State firm, and it brings to mind, of course, the unusual arrangement and perhaps pioneering arrangement in genetic research at Harvard done by DuPont Corp. where there is a funding of the research facility there to a high level with the understanding that they can get the jump on other businesses in converting the research into a profit-making undertaking.

Can you comment on that whole string of observations?

Mr. PING. It is not an Ohio based firm. We are hoping that some aspects will be, in time, Ohio based.

It is going to take some cooperation. From the State as well as from investors and leaders of that company.

There are some aspects of rural southeastern Ohio that would make the economic focus of that high technology adaptable to the location; namely, the land available.

Representative BROWN. Mainly what?

Mr. PING. They need land because you are dealing with animal husbandry as an issue in focus.

Representative BROWN. Mr. Pearson, or Dr. Winkler, any comments on sources of financing and——

Mr. WINKLER. I think the point you are making is a valid one. There is going to have to be greater cooperation.

We are exploring, if I can use the names, we are exploring with Cincinnati Milacron and the Kroger Co. a robotics program in which the university and the corporations jointly put in some substantial amount of support for the development of a research program oriented obviously toward the improvement of various robotic devices, and their uses for these corporations and for a broader spectrum of corporations, we hope.

This support of thinking has been going on for some time now all over the country with institutions such as Carnegie Mellon, Purdue, and so on and so forth.

On the genetic engineering side, one of the things that I am hearing more recently is that there is going to be a pull back by certain companies because their anticipations of very quick profits have not been so accurate.

This is a long pull, it seems to me, step by step. It is enormously promising, but there is no guarantee in this area.

Mr. PEARSON. In terms of private support for research information systems, I think the precedent has been set in the legal business, where a number of law schools now charge fees to attorneys in private practice for the use of computer network biographic research and for library access so that the private legal industry in many cases now is supporting or helping to support the funding of library research for the law schools.

That could be a prototype that might be considered for other industries.

Mr. PING. An illustration of a needed area: The coal industry needs an effective gathering and organization of the separate research that is going on in that whole area. It is an industry with a major base of activity and an ability to fund a system that would, in an update fashion, provide access to what research is going on.

It is available to both the State and the industry.

Representative BROWN. In the case of the coal industry, you have a lot of different companies putting nickels and dimes into the research project, and it is not aggregated either as an industry, nor is it aggregated or focused into any particular university location. It is a process of leadership more than anything else.

Mr. PING. Yes, and I think also some front-end investment in both the State and industry to try to put this together.

Representative BROWN. Let me suggest that some people have suggested that university research laboratories have fallen behind in quality, fallen behind the quality of the private sector laboratories in regard to sophistication of facilities and so forth.

First question: Do you think that is so? Second, if it is so, then why would business go to universities for technological assistance?

It is a sort of a combination of things that you have suggested, Mr. Ping, and does improving university laboratory facilities become, then, perhaps the most important goal even ahead of some of the other things suggested in general terms for the funding of education?

Mr. PING. It is laboratory equipment and people that you are really talking about at that level of need. I think the answer to the first question is "Yes."

In fact, the obsolescense of university laboratories is one of the basic dilemmas in the whole State of Ohio if it is going to serve in enforcing this high technology revolution.

I think that the solution belongs to the university in part because you are dealing with a basic meaning that I was trying to describe; namely, intelligence is a key in the laboratory effort.

Equipping of the labs is one thing. Preparation of the kinds of minds that can use that equipment well, that's the business of the university.

Mr. WINKLER. I think also there is a difference between short-term goals in research, particularly short-term applied goals and longer-term goals.

I don't think it is any accident that one of the factors in our falling behind—we are about 10th in productivity among the industrial nations of the world today—is that we still have the image of ourselves as the leading industrial country in the world. That's no longer the case.

One of the things that has gone along with that has been the deterioration of the research base in this country.

You could almost develop a 1-to-1 relationship. Understandably business and industry generally are concerned with short-term development, short-term profits, as it should be.

It is only in the university can we attend to the longer run, more basic research upon which most of the applied research is based.

It is a frightening thing to see what is happening in the laboratories of the universities. They are so far away from the state of the art in so much of what we do at the present time, that it is appalling, and there is it seems to me at least, both a public and a private responsibility here if this country is going to turn itself around.

Mr. PEARSON. Mr. Vice Chairman, I agree with what Mr. Winkler and Mr. Ping have said.

I add only the following: I think the interest that industry may have in cooperating and going to the universities is, on the first hand, to make sure of some specialized talent which may be there and which it is economical to use rather than to build whole new operations in-house; second, I think in many cases there is an altruistic interest on the part of industrial business leaders to support the functions of uni-

versity campuses because they realize that there exists education and training of people whom they would hire.

I think this is an altruistic interest as well as to support some of the programs in the universities.

Mr. Vice Chairman, I am afraid I am going to have to leave.

Representative BROWN. Gentlemen, I have been asked to stop because we have other panelists.

I do have a series of other questions that I will send to you, and one of them is whether or not the public higher education institutions are properly stimulated generally around the country, and particularly in Ohio, to excellence in some of these fields by the formula they are financed, and whether or not the government's system of higher education in Ohio and also in the public sector is adequate to the focus of the future emphasis in science and engineering.

We will ask these questions somewhat more specifically to you in writing and look for your written response.

Thank you very much for your contribution this morning.

Our next witnesses are a panel made up of Clifford Meyer, president and chief operating officer of Cincinnati Milacron Inc.; Robert Farrell of Structural Dyanmics Research Corp.; and Howard Foley of the Massachusetts High Technology Council.

We will ask you to sit in that order, if you will: Mr. Meyer, Mr. Farrell, and Mr. Foley.

Our first witness will be Clifford Meyer, president and chief operating officer of Cincinnati Milacron Inc.

STATEMENT OF CLIFFORD R. MEYER, PRESIDENT AND CHIEF OPERATING OFFICER, CINCINNATI MILACRON INC., CINCINNATI, OHIO, ACCOMPANIED BY ROBERT C. BEVIS, VICE PRESIDENT, HUMAN RESOURCES

Mr. MEYER. I want to thank you for the opportunity to come before this subcommittee this morning.

I am Clifford R. Meyer, president and chief operating officer of Cincinnati Milacron Inc. Accompanying me is Robert C. Bevis, vice president, human resources.

First, I would like to give you some background on our company. Cincinnati Milacron is a Fortune 500 manufacturer of machine tools, plastics machinery equipment, industrial robots, and other high technology industrial products. Our philosophy for almost 100 years has been to be the technological leader in those areas of industry in which we compete.

Through the years we have invested heavily in research and development. For instance, in 1981, Cincinnati Milacron invested 3.3 percent of its sales in research and development.

This is twice the average for machinery industries as a whole. Our success has been due largely to this commitment.

One significant result is that 42 percent of the products we now market were not in our product line 5 years ago. Ours is obviously a changing, rapidly expanding environment.

We are the largest machine tool builder in the free world and also the largest builder of plastics machinery. We were one of the early

entrants into the area of robotics. Currently we are one of the largest builders of industrial robots in the United States, offering perhaps the most sophisticated, intelligent robots on the market today.

It is interesting to note that our line of industrial robots and our plastics injection molding machines were developed entirely within our own company.

The ability to remain at the leading edge of technology, to create and implement it, requires more than investment in research and development. It requires large investments in the training, development and motivation of highly capable people. And this is an area of great concern to us.

Following World War II the United States found itself technologically far in front of other nations. Our manufacturing industries were large, vibrant, and technologically superior.

In the 1950's, through cooperative programs between business and Government, the United States stayed on top. Programs such as the Air Force project on developing numerical control gave our industries an edge and kept our technological momentum going.

Since the 1950's, other countries have matured in manufacturing technology. Their governments and industries have worked hand-in-hand, while the U.S. Government did little to help keep technology moving in our industries.

As a result, the technological gap between ourselves and industries of other developed countries has all but disappeared in some areas, and is continually narrowing in others. We cannot let this trend continue.

Some of you may be asking, "What's holding us up? Why haven't we taken advantage of our advanced technologies as other countries, such as Japan have?"

One reason has been the lack of sufficient investment capital. Another has been the lack of incentives for increased research and development.

Positive steps to alleviate these problems were taken in the last Congress through improvements such as approval of accelerated depreciation, tax reductions, and credits for incremental research. But, perhaps the most serious remaining obstacle is the availability of highly capable people that industry can train and develop.

Yes, U.S. industry has a people problem. There are not enough people being properly educated in the fields that will be needed by industry.

We believe that there must be action to determine the present and future skills needed by industry. Both public and private institutions must be encouraged to identify these skills and develop the people to provide them. Only if U.S. industry can obtain properly trained people can it continue to keep this country the technological leader.

Basically, industry seriously needs trained people in two general categories—college trained individuals for functions such as management, engineering and research and development, and high school and technical college trained individuals to work as electronic technicians, machine operators and technicians, computer programmers and systems analysts.

Quite frankly, we are concerned about the ability of educational institutions to provide these trained people in the numbers required.

Universities simply are not listening very well to the needs of industry. If anything, the communications gap between the university community and industry seems to be widening. Yes, there are university advisory boards on which representatives from business and industry sit. But we know from our own company experience that all of these boards are not working very well.

We often feel that we're included on these advisory boards only in order to placate us. That's not the way it ought to be.

Industry must adequately explain its needs to the universities and offer its support, while the universities must be willing and able to provide industry the capable, well-trained people it needs.

We often hear the cry, "Why don't you do your own training?" Well, at Milacron we have conducted a good share of our own training for both entry level and high technology employees for over 45 years.

We feel we are fortunate to be able to fund such technical development programs.

However, while industry can do some of its own training and development, it can't afford to do it all. This is particularly true when you realize that more training is necessary today because of the general decline in the caliber of high school and college graduates entering industry.

One obstacle that U.S. industry faces may surprise you: There aren't enough engineers. In 1981, there were 58,000 engineering graduates, but this is short of what industry needs.

It's been estimated that unless current trends are reversed, we would be short 70,000 to 120,000 engineers by 1990.

One of the primary reasons for this is that engineering schools are limiting enrollment due to declining numbers of faculty members who are leaving the colleges to seek higher paying jobs elsewhere or returning to their native lands. Action is needed to determine how this can be remedied.

While we will have a problem in getting college trained engineers, our "people" problem isn't isolated to college-trained individuals. Industry has great difficulty getting adequate numbers of high school and technical school persons to fill the need for skilled jobs such as technicians, machinists, and assemblers. We believe a national plan must be implemented to provide these people.

Various estimates of the extent of the predicted shortage of skilled workers have been presented to the public and to Government. For instance, one of these estimates is that industry will face a shortage of 250,000 skilled machinists and tool and diemakers by the late 1980's.

The Department of Defense emphasizes that the projected shortages will be critical if we would be forced to increase our mobilization efforts. Even in the current downturn, we must continue to try to develop means for meeting these future needs for skilled workers.

We see serious roadblocks that prevent us from getting these skilled persons from high schools and technical schools.

They include: One, young people are not as attracted to skilled jobs as in the past. These jobs do not seem challenging or inviting enough.

Two, job opportunities in industry and long-range job qualifications are not being communicated by educators to the youths.

Three, in many States, training for skilled jobs is inadequate.

Four, parents and high school counselors tend to encourage a college education when a student's qualifications and interests may be better directed toward a skilled career.

Five, in our society, there seems to be a stigma about not having a college degree. Many students turn their backs on a skilled career.

These are real roadblocks, but some States, even without the encouragement of the U.S. Government, are doing a fine job in determining the needs of industry and providing skilled employees.

For instance, South Carolina does an excellent job in this area. Its State development board communicates regularly with the State board of technical and comprehensive education. In fact, they are holding concurrent meetings each year to be sure they are planning and implementing training to meet the specific needs to meet changing technology in both existing and incoming industry.

This coordinated approach is one reason we chose to build a new robot plant and a new machining center plant in South Carolina.

I think the time has come to summarize what I've been saying for the past few minutes. First, we must realize that U.S. industry has lost the wide technological edge it once held over other nations.

A major reason we have lost that lead is that colleges, technical schools, and high schools have not provided industry with the types and numbers of trained employees needed.

Industry must better communicate its needs to the schools and colleges and they, in turn, must be prepared to listen and provide us capable individuals.

There must also be a nationwide plan to identify the skills that industry requires and to encourage private and public institutions to take action to meet these needs.

Each State must develop coordinated training for work forces that meets the realistic requirements of industries already located, or about ready to locate in the State.

Some encouragement by the Federal Government concerning this type of cooperation would be extremely beneficial.

For example, the new job training program recently proposed by the Labor Department to replace CETA by establishing State job training councils to determine skills needed and the utilization of funds for programs to satisfy these needs seems to be a step in the right direction.

In view of the increased emphasis, we feel must be placed upon strengthening and directing our educational structure, we strongly suggest that Federal and State legislatures very carefully evaluate any proposed reductions in financing for this extremely important area—our future work force must be capable of working in, working with, and helping develop the technologies that are here today and are emerging for tomorrow.

Gentlemen, our work is cut out for us. I want to be optimistic about our ability to keep pace with technology. I feel an important step has been taken today by identifying what is hampering us.

Only through cooperation and understanding will we be able to meet the demands that the coming years will place upon us.

Again, thank you for the opportunity to speak to you today.

Representative BROWN. Mr. Meyer, thank you very much for your testimony.

I am tempted to ask questions now, but I want to follow the same pattern as we did previously.

I will now ask Mr. Farrell for his presentation, and we will go then to Mr. Foley.

Robert Farrell is vice chairman of Structural Dynamics Research Corp.

Please proceed, Mr. Farrell.

STATEMENT OF ROBERT M. FARRELL, VICE CHAIRMAN, STRUCTURAL DYNAMICS RESEARCH CORP. (SDRC), MILFORD, OHIO

Mr. FARRELL. Thank you, Mr. Vice Chairman and members of the subcommittee. I appreciate this opportunity to share with you some background on the development of Structural Dynamics Research Corp.—SDRC—as well as some observations pursuant to the environment I consider relevant in the development of high technology firms in general.

My personal background includes a bachelor's degree from Xavier University in 1957 and an M.B.A. degree from that same university in 1958.

I am one of the founders of SDRC and, through the years, have become increasingly involved with the Clermont County and Greater Cincinnati Chambers of Commerce as well as the development department of the State of Ohio.

The international activities of SDRC have also afforded me the opportunity to become directly involved with economic development agencies of several foreign countries.

Our visibility, and increasing participation, which such groups has been brought about because of two factors. First, SDRC is itself a high technology firm and as such we are continually sought out and questioned by those groups interested in attracting technology-based firms to their respective areas.

The high-tech fever has certainly hit every area in the United States and almost all of the international regions as well.

The second reason is that SDRC's chosen area of expertise deals directly with two disciplines directly involved with the economic prosperity of any industrial base; namely, product design and engineering, and more effective and productive manufacturing processes.

The very survival of a manufacturer of goods depends on the fitness and timely delivery of its products and the ability to manufacture such goods in a competitive manner. Of course, there are other factors that are needed for success, such as capable marketing and financial stability, but the two factors I mentioned are fundamental to the health of every supplier of goods.

Let me take a few minutes to tell you about our company. SDRC was incorporated in 1967 as a spinoff from the mechanical engineering department of the University of Cincinnati.

Mr. Jason Lemon, who is the real entrepreneur behind SDRC and presently serves as its chairman, was then director of research in the mechanical engineering department.

The other six of us that were the original incorporators also worked in the department in various other administrative, clerical, and aca-

demic capacities. It was a busy time and I must say a very effective educational period for our students.

In the mid-1960's the level of research and development within the department increased rapidly. Our industrial supporters were very receptive to the programs and activities of the department's staff and students and their financial backing rose to a very attractive level.

Fundamentally we were providing a service that was practical, solved "real world" problems, and enhanced the in-house capabilities of our industrial clients.

Because our joint activities were, indeed, useful to the firms we worked with, it probably shouldn't have surprised us that the number of companies with which we worked grew rapidly and their financial support climbed accordingly.

But best of all was the educational experience it provided our students. Their exposure to real problems only further fortified in their minds the necessity to absorb what they were being exposed to in the classrooms on a daily basis.

In a period when they were shaping their engineering skills they were also working on real-world situations in unison with experienced engineers and engineering managers. It was a beautiful educational experience and one which I will never forget.

It was the growth and acceptance that we encountered that actually caused us to move outside and set up SDRC. The demands on our students became unacceptable. Graduate students were spending more time flying off to analyze machine failure problems than they were spending in class.

We tried several approaches to the dilemma but finally, with the mutual consent of university administration, decided that the only workable solutions were to cut back and stay internal or to formally leave the university and enter the world of commerce. We chose to set up SDRC.

Seven people put up every nickel they had, and some nickels they didn't have but their in-laws did, and raised a grand total of $35,000.

A west coast firm we had worked with over the years by the name of Special Dynamics agreed to put up $25,000 for 25 percent interest in the new venture, and so with $60,000, seven families to feed, and a lot of prayers we entered the world of business.

That was in 1967, a little over 15 years ago. Today SDRC has in excess of 450 employees, most of whom are professional engineers. Sales this year will be approximately $25 million and next year we expect to exceed the $40 million level.

Our 10-year forecast of worldwide revenues project a company of sizable magnitude. We are presently headquartered in a modern 75,000-square-foot facility in Milford, Ohio, just outside the I–275 circle freeway, due east of downtown Cincinnati.

We have recently announced plans to add to our present facility and plans are presently being drawn for this expansion. We intend to build a 14-story high rise, the first high rise in Clermont County by the way, which will add 110,000 square feet to our present building and bring the total of our Milford facility to 185,000 square feet.

Our Milford operation is located in Park 50 Techne-Center, a 422-acre research park which we conceived and also codeveloped. This

park is a true high-technology community and is dedicated to firms related to the theme of computer aided engineering.

With the completion of four additional buildings that will be built this year, the total space in the park will reach the 500,000-square-foot figure and the employment level will be 1,500 people, most of which will be professionals.

Besides Cincinnati, SDRC presently has consulting and computer service operations in San Diego, Calif.; Detroit, Mich.; Wiesbaden, Germany; Paris, France; London, England; Tokyo, Japan; and Toronto, Canada.

Since its inception SDRC's mission has been to be a worldwide service company in the technology application business, offering engineering design, engineering data management, related manufacturing functions, and consulting, computer and educational services.

SDRC intends to be a significant factor in the way engineering and manufacturing are done in the world and to be recognized as a center of technical excellence, business excellence, and people orientation.

SDRC's entire business has been built on the premise of providing problem-solving tools and techniques to our industrial clients.

We apply highly sophisticated methods to relieving the very real pressures that confront the manufacturer of goods in today's environment. Not the least of these is the pressure that producers of products feel from worldwide competition. Obviously our automotive industry is a good example.

Other pressures are that buyers are demanding improved efficiency and reliability in mechanical equipment and products; manufacturing executives are demanding reductions in design time and cost; Government regulations demand concentration on safety, pollution, and noise control—regulations which didn't exist 10 years ago.

Finally, we have the energy crisis and the demand for the preservation and conservation of our natural resources. Engineers in all industries are facing these pressures.

It is important to note that any success SDRC has had can be attributed to the fact that we have dedicated to two very fundamental strategies. They are: One, our concentration on taking a "systems approach" to the overall area of product design; and two, a total commitment to integration and implementation.

This is an appropriate time to examine the process by which high-technology organizations are born, take shape, and grow within any given geographic region.

It is appropriate because what I have just said about SDRC is, in my opinion, directly parallel to what is needed to spur high tech, rapid growth industries. Those concerned with economic development need to recognize that what is needed is an overall "systems approach" and a concentration on "integration" and "implementation" processes.

Don't be misled by the simplicity of my last remark. Like everyone else, I am very familiar with the checklist that every researcher of this subject comes up with. Close university-industry links; labor supply; energy supply; business and political climate; availability of venture and risk capital; quality of life; entrepreneurial assistance programs; the list goes on and on.

I heartily agree that each of these is an important ingredient in the overall program of creating a dynamic environment for high tech-

nology. But the ingredients will not make the situation happen by themselves—as ingredients alone do not make a cake.

It is the use of a systematic approach coupled with proper integration and correct implementation that gets us our cake, and it is what is needed to get us our high technology environment.

Our technical park, the very products an SDRC offers, our high technology company itself, are perfect examples that the factors of which I speak are not pure generalities or unimportant intangibles, but rather are the fundamental framework that makes it all happen.

The prowess of the Japanese manufacturing community is a good example. We've been active there for many years and several of our people have recently been exposed to some of their most automated production facilities.

There is no revolutionary technology practiced in Japan today. What they have done is do an excellent job of systematically integrating present known technologies. The results of these efforts are being felt around the world today.

In closing, I'd like to say that those regions that devise effective mechanisms that can act as focal points and catalytic agents for the resources they have at hand, or can develop, will be the areas that reap the harvest; which will be the areas that can attract new companies; will be the areas in which entrepreneurship will flourish; will be the areas that are positioned to catch the next technological wave and not be struggling to capture what has already happened somewhere else; will be areas that will capitalize on the myriad of exciting opportunities that are just asking to be done.

As previously stated, I have been actively involved with many individuals and groups interested in developing high technology industrial bases. I have coauthored some initial thoughts that were presented by a fellow Ohio businessman to a hearing of the congressional Subcommittee on Science, Research and Technology of the Committee on Science and Technology—February 16, 1982.

For your information, and for sake of time, I am providing you with a copy of that testimony along with this written statement.

Thank you for allowing me the time to address you this morning and I'd be pleased to further discuss my thoughts with you on this subject at any time, if you think it would be useful.

Representative BROWN. Thank you very much, Mr. Farrell. Our third witness this morning is Howard P. Foley.

Mr. Foley, please proceed.

STATEMENT OF HOWARD P. FOLEY, PRESIDENT, MASSACHUSETTS HIGH TECHNOLOGY COUNCIL, INC., BOSTON, MASS.

Mr. FOLEY. Thank you, Mr. Vice Chairman. I am Howard P. Foley, president of the Massachusetts High Technology Council.

I would like to extend the greetings of the Governor of the Commonwealth of Massachusetts, Congressman.

He enjoyed testifying before your subcommittee, and it is at his request that I am here today.

For those of you who might not be familiar with the Massachusetts High Technology Council, I suspect there are a few in this room, we are an association of 125 high technology companies.

Most of our members can be characterized as growth-oriented, high-value-added, knowledge-intensive companies that spend proportionately large amounts of money on research and development, and depend primarily on high technology for their products and services.

We employ about 115,000 people in Massachusetts, and about 85,000 more throughout the rest of the world. Sales worldwide last year totaled approximately $11 billion, and we invested almost $2 billion in new plants and equipment—up 36 percent from 1980.

We are in business to nurture the profitable growth of the high technology industry in Massachusetts. Compared to other industrialized States, Massachusetts has one of the lowest unemployment rates in the country.

High tech has not had the severe problems other manufacturing industries have in this recession, and even though we've slowed down quite a bit, the help wanted pages of the Sunday newspapers are still filled with high tech ads looking for engineers and computer scientists.

However, we are suffering from our own success. The reason so many positions are unfilled is simple—the supply of technical talent has finally been outstripped by industry demand—and unless the high tech industry, Government, and educators work together to alleviate this concern, our State— and all those who live and work in Massachusetts—could be in trouble.

Up until very recently, State government and education—as institutions—played minor roles in high tech growth and expansion.

Historically, much of the high tech industry in Massachusetts grew out of the space and defense programs, and the baby computer and communications businesses of the fifties and sixties. During this time, while many of our high tech company presidents were in engineering school, and others were working on aerospace and defense-related projects in both the public and private sectors, they saw unlimited opportunities to commercialize some of their own ideas using high technology.

Some talked a few banks into investing seed capital—others talked commitments out of far-sighted venture capitalists—and still others simply mortgaged everything they had and began working 7 days a week out of their garages.

People put their money behind an idea, and then worked like hell to create new markets, satisfy the demands of emerging ones, and make the product turn a profit.

I might add that even without taking a proactive role—and I want to emphasize the word proactive—Massachusetts' educators played a big part in high tech development simply by offering a superb education to students who chose to study here—for it is quality education—more so than anything else—that spawns high tech development.

High tech companies must have a growing supply of technical talent—engineers, technicians, programers, and the like. High tech is the brains business, and brainpower is to us what waterpower was to our old textile mills. Without it, high tech grinds to a halt.

For 200 years, Massachusetts has had an outstanding educational infrastructure—independently supported institutions at first, with publicly supported institutions coming in later on—and the talent pool provided by academia fueled the past 20 years of high technology growth.

However, the present output of engineers, computer scientists, and technicians from our area schools is no longer keeping pace with the demands of industry, and as talent shortages grow in other States, recruiting expeditions by out-of-State firms, seeking to hire our technical talent away, continue to intensify.

Many recruiters talk about the high heating bills and severe winters characteristic of New England, but most simply compare personal income tax burdens and cost-of-living differentials—which are traditionally high in Massachusetts—to sell the so-called Sun Belt to Massachusetts engineers and computer scientists. In many cases, the numbers can do all the talking.

To counter this, the State government, academia, and industry must do more than just talk about the need to cooperate, collaborate, or commiserate.

They must play a real proactive role to insure the continued growth and expansion of the high tech industry.

It has become, and will continue to be, the indispensable economic core of this region's industrial and economic development.

This means working to keep the statewide personal tax burden competitive, thereby attracting technical talent from other States, and making it easier for home-grown engineers and computer scientists to stay in the Commonwealth of Massachusetts.

It also means working to expand the capacity of our technical and educational programs, and improving the quality of the programs we already have. We've made a lot of progress in the last 3 years on both fronts, but much more still remains to be done.

Massachusetts should be able to hold its own with any other State when it comes to the production of degreed professionals. Yet, we find today that the State of Texas annually graduates more electronics engineers and computer science majors than we do. In 1958, Texas graduated 492, and Massachusetts graduated 781. In 1981, Texas graduated approximately 4,000, and we graduated about 3,000. That's against a projected demand, just from our member companies, of about 3,000 a year over the next several years. Worse still, about 25 percent of the Massachusetts graduates will leave the State after they graduate.

Nationally, this country produces, per capita, only half as many engineers as does Japan. Further, only 5.7 percent of our bachelors degrees are engineering, and in West Germany, over 37 percent of their bachelors degrees are in engineering. We're told the U.S.S.R. and the Eastern bloc countries are doing even better.

Massachusetts has traditionally hovered in the 5-percent range, and the High Tech Council has implemented a number of programs designed to help expand capacity and improve in the short term.

We have established electronic technician training programs for technical paraprofessionals, stepped up recruiting efforts at out-of-State engineering schools, and worked with the State and community college system to initiate technical writing and computer programming courses for former school teachers who have been laid off due to declining enrollments.

To help over the long term, we recently developed, and formally endorsed, a white paper on industry/university relations, geared specifi-

cally toward expanding engineering and computer science education opportunities over time, and improving existing curricula.

Specifically, there are eight points: One, support for higher education must be viewed as an investment in human resource development, and not as a charitable contribution.

Two, member companies should increase their financial support for higher education in 1982 to 2 percent of their annual research and development expenditures, and then sustain that support on an annual basis for the foreseeable future.

Three, industry must go beyond financial assistance by identifying and replicating collaborative activities that already work well, and work to implement others.

Four, companies should work with universities to develop more relevant curriculums and research projects, anticipating the future.

Five, companies must become more professional and more active in recruiting at regional universities—sustaining recruiting programs in lean years, and not just in growth years.

Six, companies must work to develop and financially support joint programs in continuing education with universities. In the future, learn while you earn will be the norm, and not the exception.

Seven, companies should become visible, active supporters of elementary and secondary level education—promoting high tech careers, stressing the importance of computer literacy, helping to strengthen math and science curricula, and working to improve teaching methods and techniques.

Eight, the high technology council should encourage State government to increase its support for higher education, particularly with regard to technical education.

Not surprisingly, the 2 percent of research and development support for higher education has attracted the most attention. In fact, many news stories and editorials have adopted it as the 2-percent solution, and translated it into a minimum investment of $15 million in Massachusetts—just from our 125 member companies.

We will not, however, serve as a foundation or central money fund. Instead, we will act as a facilitator and clearinghouse—bringing individual companies together with colleges and universities, so that they may develop mutually beneficial one-on-one relationships that involve more than just financial assistance and equipment donations.

We will certainly help both sides help each other, if we think we need to be involved. But we would prefer to let the companies that are donating the time and money hash it out directly with the educators.

Many of our members are already involved in university relations programs with local schools, and in order to strengthen the linkage and recognize its importance—one company, Analog Devices of Norwood, Mass.—has taken university programs out of its corporate contributions committee—and established a separate university relations committee, headed by its vice president of strategic planning.

Some of the programs our companies currently participate in include:

Career development faculty chairs—whereby a company will finance salary and equipment costs for a new or expanding high technology program at a college or university over an extended period of time,

improving the quality of life for the professor, and the quality of technical education for the students.

Adjunct professorships—whereby companies loan employees to colleges and universities to teach courses in their chosen fields of expertise once or twice a week. Data General, for example, has two employees teaching at Lowell University on a part-time basis.

Curriculum and faculty development and assistance—whereby companies help schools expand or improve technical curricula by providing technical assistance to company training programs. Lowell University, for example, has three professors enrolled in training courses at Data General.

We at the high tech council recently published a guide for universities interested in developing computer science and engineering programs that deal with the skills and knowledge requisite to high tech employment upon graduation—and women who have math or science backgrounds, but lack technical degrees, and presently earning master's degrees in electrical engineering and computer science at Northeastern University in a women in engineering program, facilitated by the high technology council, and sponsored jointly with the Bay State Skills Corp. and Northeastern.

Learn while you earn and continuing education—whereby companies can offer part-time consulting contracts to engineering and computer science masters and doctoral candidates, encouraging them to continue their education by alleviating some of the financial pain that accompanies this decision—and by developing retraining programs with colleges and universities that can be used to bring older employees up to speed with new technology.

It would take too much time to go into detail on all the programs we use, but if you wish additional information, please ask me for it later. I might add that current Federal tax policy concerning research and development tax credits and equipment donation deductions have made corporate investment in higher education virtually painless, and I would not be surprised to see many companies follow the lead of Wang Laboratories in Lowell, Mass., which recently made its first contribution to higher education—a $3 million equipment donation to the Massachusetts University system.

On a more personal note, I wish my colleagues in education would stop talking about the hole in the Federal money bucket, and look instead into industry's money bucket. Many of these tax incentives are designed to fill our money buckets—allowing us to give to colleges and universities without the 20 percent handling charge that Washington normally skims off the top to do this for us.

With regard to State taxes, the high technology council has been a vocal supporter of proposition 2½—the property tax limiting referendum question that was overwhelmingly passed by Massachusetts voters in November of 1980. Personal tax rates concern us far more than do business taxes. Our chief resources are our employees, and personal taxes affect our companies far more than do corporate taxes.

Many other factors concerning high tech development—proximity to overseas markets, good airports, decent roads, reasonably efficient and reasonably priced State, county, and local government services—certainly play a role in every high tech company's ultimate decision.

but a strong and responsive educational infrastructure and a reasonable State and local tax burden on our employees and their families mean more than all the rest.

In Massachusetts, the future of the high tech industry will depend, to a large extent, on the Commonwealth's ability to grow and sustain a proficient technical workforce. It should be remembered that this is no longer an issue that can be addressed independently. Instead, all three pieces of the puzzle—industry, academia, and Government—must play active roles to overcome the manpower problem.

One essential step, but certainly not the only step, for any State interested in developing a strong technology-oriented economic community, would be to encourage initiatives which would result in our graduates at all levels having more computational skills than they do today. Along with this would come a greater familiarity and literacy with analytical tools like the computer, making it possible to function more successfully in society as it exists today—and as it is with analytical tools, like the computer, making it possible for them will continue to evolve into the future.

But educational institutions cannot do this alone. They need help strategically, logistically, and financially. Industry must be a partner—providing assistance—recognizing that an intelligent investment in education is an enlightened investment in its own future expansion, growth and ultimate success.

In the long run, this investment will help everyone—for to be technologically rich is even more valuable than to be oil rich, because technological creativity is inexhaustible, if we seize the opportunity which is before us.

I want to thank you for this opportunity to speak before this subcommittee and would be pleased to answer any questions you may have concerning my remarks.

Representative BROWN. Thank you very much for some very challenging testimony, not only challenging for this subcommittee, but also challenging even to other witnesses of the subcommittee.

Let me turn my first question to Mr. Meyer.

Mr. Meyer, pursuing a statement of your testimony, specifically what kind of training program should the State of Ohio initiate to encourage you to build robots in this State rather than South Carolina?

Mr. MEYER. More emphasis at the vocational level and the technologies of machining, basic engineering, and manufacturing engineering, and provide training facilities for upgrading existing people in the work force. This is what South Carolina did for our facility.

Representative BROWN. But am I to read that the vocational system in Ohio was not as responsive as that in South Carolina?

Mr. MEYER. I don't think I can address that question with any degree of accuracy.

I can indicate to you that as far as the State of South Carolina was concerned, they had the facility in place and welded their training structure with our required training structure; in essence, did a lot of recruitment initially with people we wanted to employ, and then they trained them on the lines we wished them to be trained.

Representative BROWN. These were not high-school students?

Mr. MEYER. These are people from the existing work force that wish to upgrade themselves in the work force.

96-832 O - 82 - 3

Representative BROWN. Is the lack of highly trained scientific personnel a major problem for you in this area compared to other areas of the country where you work?

Mr. MEYER. No, I think it is a national problem.

Representative BROWN. So we are not necessarily behind the power curve locally, but rather nationally behind the power curve.

There are some widely diverging statistics or estimates of the growth of robots and robotics over the next 5 to 10 years.

Do you and your staff feel that these diverging statistics are accurate, or do you have a comment to make on the direction which you think is going to occur in the development of that field?

Mr. MEYER. I think the growth rate of robotics is going to closely parallel the growth rate we have experienced in the electronic computer field, somewhere in the 30 to 40 percent growth rate per year.

Representative BROWN. We will be soon releasing the Joint Economic Committee study that argues that robotic development will help working people of this country by leading to higher wages, more job opportunities and better working conditions.

Many people, however, seem to be scared of the robotic revolution that is coming. What is your company doing to ease concerns of people that robots are dehumanizing machines that will take jobs away from hard working folks?

Mr. MEYER. Short term, the installation of robotics has replaced the worker in poor environment jobs and in jobs in which the worker did not wish to work in.

So it has not really had a displacing effect. As we move ahead into other areas, we talk of assembly in the future, industry must retrain those workers to service those robots, to service the computers that drive the robots, and to move into the lower levels of programing for those robots and give an educated work force base that has been outlined in testimony that I have heard. That is relatively easy for a company to do.

Representative BROWN. The statistics would seem to indicate that we are behind the power curve with reference to robots in terms of our competition with the Japanese and perhaps with some European countries.

First, would you agree with that and, second, what do you see that can close that gap, or are we going to wind up losing this race to foreign competition?

Mr. MEYER. When you look at the installed robot base in Japan and you look at the numbers that are quoted, you have to break that total number down into those that are computer driven robots, the intelligent robot, versus the work-hand robot.

If you break that down, the Japanese installation of the intelligent robot is not as formidable as one would believe.

We in U.S. industry probably could classify a lot of automatic loading and unloading equipment that exist today on machinery as a robot. We are not far behind Japan in the installation of intelligent robots as we determine, if indeed we are behind at all.

Representative BROWN. Do you think we can keep up competitively?

Mr. MEYER. We believe so. In terms of technology or in terms of the installation?

Representative BROWN. Either one.

Mr. MEYER. Either one. In terms of technology, we are ahead today in intelligent robots, but we must continue to invest in research and development, and it requires additional engineers and skilled people, as I mentioned.

The other aspect of it is industry investing in them in their own work place. I think the Congress has addressed the capital recovery program in a way that makes it attractive for industry to so invest.

It is now their decision, and they must make a decision to invest to modernize.

Representative BROWN. Let me ask that you make an economic prediction for this committee. There seems to be concerns at the political level in the U.S. Congress, and to some extent, in the staff around the President saying, "See, we gave industry all those tax breaks, and they really have not modernized their capacity and moved into the future as aggressively as we hoped they would do."

Do you want to comment on that? Tell us whether that is going to occur or whether it maybe is going to discourage us from granting further tax breaks or even letting the existing breaks continue to exist because industry has not moved.

Mr. MEYER. Industry that is making the investment decisions today in general is looking at a plant that is operating at what they call 70 percent of capacity.

So it is extremely difficult for a lot of industry, if they look short term, to make investments that would improve productivity.

Industry must take the long-term view, not the short-term view, which characteristically, in many cases, is probably done. Counterparts, in the world that we are competing in, do not take the short-term view. They take the long-term view.

We can lower the interest rate. That might help in the long term.

I think the falling interest rate would be very beneficial on an investor decision. There is a lot of demand out there today.

Representative BROWN. Mr. Farrell, if I can switch to you, you seem to be taking the long-term view in terms of product improvement, and I would almost ask you the same question.

Do you see in both products and production improvement the prospect of industry taking the long-term view and taking advantage of the tax benefits which I say modestly began in this committee in about 1978 and 1979 when Senator Bentsen and I called for a $25 billion tax cut and were considered to be a little radical, and then the tax cut was made even greater than that and now there are still people that think we are too radical.

What do you see in terms of that kind of effort?

Mr. FARRELL. I guess I see about a 100 percent chance that is going to happen. I think there will be a technological movement.

I do not think there is any question that our manufacturing is going to take different shapes. I don't think it is going to happen overnight. There are some reasons why.

One is the people problem. Both of my associates have talked about training people and education, but when you look at the competition, when you look at the total, much like my associate to my left, we look at the people who have bodied together, the East Germans and the Japanese.

The comment by Mr. Meyer, again, they are looking at the long term and group benefits and sacrifice the individual roles to achieve the long-term goal.

I do not think there is any question that change is going to take place. I think one of the things that is going to slow it down is a lack of game plan on how to do it.

Mismanaging the way that products are built, each department and each organization will go out and obviously do the best they can do. They will purchase the latest in equipment. They will be driving for what they think is best for the company, but in a sense, without this integration aspect, without anybody working for the same goal, many of the companies we work with know they have a 30- to 32-percent waste of their engineering time because this fellow over here is already working on something that the fellow over here has already changed.

There is a lack of coordination and capable coordination. The computer, computer techniques, will allow us to do that kind of thing so I think there is no question about that that will happen.

I think one of our problems is that we do not yet have a very systematic approach. You ask most people and if you ask 50 people, you will get 50 different answers.

Another thing we have got to be careful about, Mr. Vice Chairman, I think, when we talk about high technology and things of this nature, we relate it to the robots and things of that magnitude.

The change in manufacturing, when it takes place, high technology is going to be needed in a great many areas, all the way from personnel kinds of things to managing—psychological impact, the retraining.

We can't just think of high technology as those chipmakers down at Silicon Valley. High technology approach is going to have a systematic use of a computer and into all phases of manufacturing. That is what is going to take coordination and cooperation.

Representative BROWN. Who does coordination? I might say that there are some folks in Detroit, AMC on the one hand and Ford on the other, who might say that timing in these decisions, as it is in Roman humor, is everything.

Mr. FARRELL. Certainly.

Representative BROWN. And that, therefore, one has to be able to do these things at the right time or you lose your shirt because you don't have the market that sustains it.

Can you speak to the timing question just briefly?

Mr. FARRELL. I think it is not only a question, it is one of the problems. In some of the areas, particularly production, if you take a look at the U.S. situation, people of this nature, where they have the north oil, they have money and resources. They have certainly got the educational talent because for years they have been strongly educating people.

They have not been able to put it into practice. One of the problems is really just the doing of these things.

I think when we have various groups, various technologies, you have got a very, very complicated problem.

When you talk about the aspect of manufacturing itself, you are talking about the material handling, the movement of materials.

You are talking about all the aspects that have to go into pushing raw material in the front end to get the finished good at the back end.

I think that one of the problems is the lack of direction of the pay back in those areas.

Representative BROWN. The Japanese seem to focus on that as sort of a national, almost national socialist kind of objective and put their financial resources, their technical resources, their organizational concepts and their natural national discipline on to the same issue.

You note in your comments that there is no revolutionary technology practice in Japan today. What they have done is do an excellent job of systematic integrating present inhouse technologies.

I gather by inference you are suggesting we have not done that?

Mr. FARRELL. That's correct.

Representative BROWN. Who is to do that? Are we to change the economic and political structure to do that as a control technique?

Mr. FARRELL. I think what I am proposing is perhaps a way to have everybody work in some type of concerted effort disposing of certainly the capitalistic system and the entrepreneurial push.

We are obviously believers in that type of thing. We must find mechanisms to free up those kinds of people.

I think one of the symptoms is that too many times the leaders on the leading edge of technology are an industry and have a difficult time of communicating that.

This gap does exist, but if you look at the center of our problem, look at our economic people who are seeking funds from their boards of regents and various funding sources, look at the Government agencies who are delegating such funds, most of these types of institutions, the bankers and the venture capitalists, are manipulators of funds.

They have power in their hands to make things happen in the use of funds.

But in almost all cases, they must seek our technological help because, if they don't, they fall back on the proven techniques of the past.

If I am an educator, I am going to be much more in tune by allowing my joint vocational schools to get into drafting techniques and allocations of capital equipment for drafting.

I feel comfortable with those things. I understand those things as compared with a new type of computer.

What that forces our academic community, our development institutions, to do is to back off and not be on the leading edge, but they are, in a sense, a catch and follow situation. They don't have the technological nimbleness to stay out in front so, therefore, they follow.

They are training people for us that we needed 5 years ago, not people that we are going to need 5 years from now.

Representative BROWN. Mr. Foley, in your list of specifics, you talk about a number of specific things that ought to be done.

The company should work with universities to develop more readiness and anticipation. How do you go through that shell between the company, on the one hand, and the university, on the other hand?

Mr. FOLEY. It should be a lot easier now because there is a need on both ends to break through the shell.

I am not sure that was the case 5, 10, 15 years ago. They need our money, and we need them because we need their graduates and the kind of research activities that they perform.

Representative BROWN. If you do not get them, where do you go? Private research corporations or to the establishment of in-house research facilities?

Mr. FOLEY. I think it is a combination of all strategies. We always do a lot of in-house research activities, but we also rely on this State's very, very solid educational infrastructure.

It has taken a couple of years of coordinated effort. It took our own council speaking with one voice about aggregate demand to get our numbers straight.

Previously any company would trip into a MIT or a Northeastern or what have you and say, "I need a lot of engineers," and they would ask, "How many?"

The answers were pretty vague. So it really took something like the high technology council to do the initial work.

Representative BROWN. Those were brought together by——

Mr. FOLEY. By establishing this council.

Representative BROWN. Is that a matter of governmental or state authority, or was it done voluntarily within the association of the business institutions?

Mr. FOLEY. Voluntarily by industry. Companies got together and said, "We better get together and try to do something about this collectively."

Representative BROWN. Mr. Ping mentioned the difficulty of getting the coal industry in this state together, for instance, or you could say, in effect, in this region because the same problems afflict Kentucky and West Virginia and Ohio with reference to the coal marketing problem of sulfur content and the technical use of that coal.

Do we wait for the coal industry to get inspired, or is there some flash of lightning that gets them going?

Mr. FOLEY. I really can't comment on the coal industry. Maybe it does take a flash of lightning.

I know it did take some aggressive industry people to convince their colleagues in industry that it was their responsibility to try to do something collectively, and without that, we probably would be drifting along waiting for someone else to do the job.

Representative BROWN. "Collectively" is a word with our anti-trust laws——

Mr. MEYER. My attorneys suddenly say collectively, what do you mean? We have antitrust problems.

Representative BROWN. That is why you get the opportunity to pay attorneys instead of research professors, right?

Mr. Farrell, what about your company?

Mr. FARRELL. I agree with everything that is being said. What we have done is we have gone out and done it ourselves.

We have a university program by which we are working with some 30-odd universities at the present time supplying, through our vendor relationships, computer power, computer hardware, giving them software, raising dollars for them.

Representative BROWN. The 30-odd universities, what do these universities have in common?

Mr. FARRELL. They understand that there is a tremendous need for engineering talent to be developed today and in the future.

Representative BROWN. Is that within the university itself, or what gets them together like the coal industry?

Mr. FARRELL. What gets them going is somebody like ourselves. We go to the university.

Representative BROWN. How widely dispersed are those universities?

Mr. FARRELL. Oh, I would say 25 in the country. We are starting to work with the United States. A lot of work with Ohio State; a couple more Texas A&M, MIT, Purdue.

Representative BROWN. How do you pick them?

Mr. FARRELL. We are an engineering company. We know the engineering schools and the people who are doing things.

Representative BROWN. So you are going after the existing engineering schools that are outstanding? Is that a fair determination?

Mr. FARRELL. That is fair to say, yes, or that are outstanding at the same time and are willing to look at the needs to make change.

Things we have gone to the universities with is the fact that we will help them raise the support in equipment and dollars from our industrial clients, General Motors, people who need these people, but they at the universities must get into fundamental changes in their curriculum.

They have got to get into advanced techniques. They have got to look at what is really needed today.

Yes, the fundamentals of calculus and the same fundamental classes, but also it does not do any good for a student, who 5 or 6 years ago had a Ph. D. in math, and never needed a computer.

Mr. MEYER. I agree wholeheartedly. Our company works with quite a few universities also. We assess their programs and their understanding of what you are trying to accomplish and make your selection of the university you are going to work with.

It is not getting five or six university presidents together. It is even on an individual basis. You assess the ability.

Representative BROWN. Mr. Foley.

Mr. FOLEY. I agree with that.

Representative BROWN. I think we should have had the panels reversed. We should have had the university presidents come after this panel, and perhaps put them through the next comments.

Mr. FARRELL. I was listening to the comments that you made to the professors, though, about whether they agreed with the fact that they were not on the leading edge, that industry was out front.

It was difficult for them because of their need of equipment, their need for computer power, their need for resources, that's the response you get to keep them out front. We are in a Catch-22 situation.

We have got to prime the pump. We have got to find some way to get ahead of the game instead of being continually catching up. That is what our foreign people have done.

Representative BROWN. I think there is an important point in the hearing. Let me just ask you a question.

I am under the impression that at least one very small college in the State of Ohio, namely, Marietta, was stimulated a few years ago by somebody who is one of the leaders in the business community here, Ed Harness of Procter & Gamble, who was on the board at Marietta,

to get into petroleum engineering as a curriculum area, and that now a third of the students in that institution are petroleum engineering students, and I know last year at least two of those students with their bachelor of arts degree went out at a beginning salary of $40,000 to practice their science or art here in Ohio with that training.

I think that is a program that is relatively new, and it is accomplished with some four or five professors on the faculty of the institution and, I would assume, a certain amount of funding of laboratory facilities and so forth.

But it seems to me that it is an example of a small institution, private institution, moving rapidly into a field that was stimulated almost by an individual.

Both of you are Ohioans. Do you want to comment on the response within the State and university system versus the private university system?

You have what you have specifically experienced because you are a Xavier graduate who worked with the University of Cincinnati professors. I did not want to focus it that much when we started the hearing, but let me press you on it.

Mr. MEYER. I do not think, frankly, Mr. Vice Chairman, that I could comment or generalize on any Ohio university versus others. Each have pluses and minuses in working with all of them.

Representative BROWN. I am not really asking you about their quality, but their responsiveness.

Mr. MEYER. Well, I think it differs by the university, the head of the department, or the head of the college and the top head of the university itself as to what responsiveness you get.

You can't generalize. It is not staked down. It is local with respect to that particular university or that head of the college of that university, how he perceives it.

Representative BROWN. You apparently made a fairly nasty choice in your relationship with technical as opposed to universities on the training program out of consideration of the quality or the responsiveness of those vocational schools in South Carolina versus the vocational schools in Ohio, and I would assume the same decision would be made in higher education.

Mr. MEYER. Well, in some, I think it is localized. I don't think you can generalize.

Mr. FARRELL. I think our experience would be that it is a two-padded answer to say that the public schools are this way and the private schools are this way.

It also gets back to every one of these cases you are talking about. This association has done well because there are people who have gone out and done things. The same thing is here.

Too simple of an answer to say public versus private. The universities have had people in there to provide leadership and are the ones that are really running and getting ahead of the ball game. The others are not. The others are speaking out. Where are my funds? Costs are going up. "I need more budget."

I think the universities that are responsive to the industrial needs and will react accordingly can find and will find sufficient industrial support to give them a great deal of boost in their developing process. The schools that I am familiar with are really deceiving.

Representative BROWN. Mr. Foley, you have listed the specifics of how you get this relationship. What comes first? What is the spark of lightning, the genesis, that gets the thing going?

Mr. FOLEY. Same thing that gets anything going: Interest and need. Two parties bring in a third one, if it is needed.

In this case, State governments come in sooner or later because they do have a role to play on some of the issues that are perhaps more broadly important to the companies and the people they employ. But only after a clear recognition that we needed each other in Massachusetts. We were there and we both wanted to get together, and it just took some people to decide to do it.

I think if you left the universities alone, they would just take longer to go about solving some of these problems.

Perhaps they have never been out to an industry before. In many cases, when they do come out, they do not know how to make their case so we have to help them in that regard.

On the other hand, we have to be more articulate in defining our specific requirements, building some credibility with the universities and putting our money and resource where our mouth is.

Representative BROWN. I have heard that it was the financial community in the Boston area that sought out who had new ideas, relatively new high technology industries, and offered, in effect, to support those new ideas financially with venture capital to get them started in the area to replace what were three or four suddenly dying industries in that area, textiles, leather and shoes, the watch industry and so forth.

Is that an overstatement of the case, or is it a partial statement of the case?

Mr. FOLEY. It is an overstatement. The vanishing textile industry had nothing to do with the interest of some far-sighted venture capitalists to see high technology coming.

It kind of happened by accident. What appears to be the norm back in the early 1960's and 1970's was a very bright young college graduate, typically from MIT, WPI, Northeastern, University of Lowell, in some cases RPI up in upstate New York——

Representative BROWN. You have not mentioned Harvard Business School, but it is all right?

Mr. FOLEY. Harvard Business School was a nonevent in this particular phase of our growth, but what happened basically was an individual with a good idea who either was discovered by a far-sighted venture capitalist or maybe an aggressive manager, and they did business.

There was not any grand statewide development plan, not orchestrated by any other parties. It just happened.

When the resources got together with the brains and the willingness of some people to build a business, we had some tremendous successes.

Representative BROWN. Let me try to ask the question a different way. What single element do you think would be the most important to a new high technology company?

Mr. FOLEY. I think, if I were out here, say, in the middle of Ohio and I was trying to attract a high-tech firm, I would want to be

located near a university or a college; one that has a track record or has the possibility of developing a very responsive engineering computer science program.

After that, just about everything else is significantly less important. That is what I think.

Representative BROWN. Mr. Farrell.

Mr. FARRELL. I agree. The prior comment I might comment a little bit on. It seems to me that what has made the possibilities of development happen, wherever they have happened, there was a university; there was venture capital; there was a community that was interested in such; but the first thing that really happened was that individuals or entrepreneurs started the ball game going. That fellow that came out of MIT or developed the computer methodology, I am not sure that the financial venture capitalists sought him out as much as he sought them out because he had a burning desire to do what he wanted to do.

What did happen, when the connection was formed then the rest of the logical connections came in place. Obviously, I would want to go back and work with my university. Obviously, I will want to become involved with the financial community.

Representative BROWN. Just stop right there. It has been suggested that you could fly to Silicon Valley. It takes a few hours, or to MIT. That's a 3-hour, 2½-hour flight.

Do you want to respond to that? Why can't that occur here based on MIT?

At one of our other hearings, it was suggested that literally it is the guy with the idea who would like to be able to drive for 45 minutes to get to his professor at the university and be able to pursue something over a period of several weeks or months and have the personal contact. Is that significant?

Mr. FOLEY. It has been significant in our experience. This concept of walking over to see the professor, becoming very much involved, collaborative efforts in the lab 20, 30 minutes away is a big issue.

It affects many of the expansion plans of our companies. It is kind of a three-phase thing.

First step is to add on to the back of the existing plant. The second step is to add on to it within a 20-, 30-, or 40-minute commute.

If you can't do that, you might put it anywhere in the world.

Representative BROWN. You do not feel the same kind of romance about your banker?

Mr. FOLEY. We don't.

Representative BROWN. Mr. Farrell.

Mr. FARRELL. Again, I go back to the point that I am not sure that to develop these types of things you have to be cozied up to the university.

I fundamentally believe that that relationship needs to exist, but, again, I come back to the fact the entrepreneurs and drives make it happen and then those relationships are formed.

The same thing with the banking community. They can't drive, the financial community can't drive. They don't even understand when a man comes to them whether the widget will work. They run out to the local technologist and/or local university——

Representative BROWN. You are a small company, though. You represent a relatively small company with reference to at least Milacron. Have you changed any curriculums?

Mr. FARRELL. Yes.

Representative BROWN. Have you?

Mr. MEYER. In certain areas, yes.

Representative BROWN. Specifically, I do not mean to ask the names, but——

Mr. MEYER. With respect to certain engineering categories that are implicit in automation, and manufacturing engineering, there have been no curriculums in universities for manufacturing engineering, which is the heart of the application of the manufacturing process we talked about.

And now certain universities, in assistance with some of our people, are beginning to look at this and as a curriculum in college.

Mr. FARRELL. Not only the curriculum, you have to be concerned with the following situations: When nuclear was very popular, everyone wanted to become a nuclear engineer. Then it was aerospace. The manufacturing revolution is going to happen in front of us.

I would fail if I didn't say that there are very few people, there are some, but there are very few people who are still contemplating that the place to be in the next 10 years for my son is a manufacturing engineer because that is where the action is going to take place.

We are always following the path of excitement instead of getting in front of it.

Representative BROWN. How easy is it to change the cathedral of MIT versus Lowell, I think is one you mentioned?

Mr. FOLEY. They are both cathedrals. MIT has been more well known. It is very difficult to change MIT.

Representative BROWN. It strikes me a little more gothic than Lowell.

Mr. FOLEY. We spent several years with the former president trying to get him to do four specific things. He did not do any of them.

MIT has a new president, a fellow by the name of Paul Gray, and he has done all four of them.

Maybe it is because he was an electrical engineer and perhaps understood more clearly what we were talking about, or maybe he was just worn down by collective efforts of 125 people beating on his door, but we had some specific agenda items from MIT, and we have responded, I think, very appropriately after we did our homework.

The University of Lowell is a good example of a little university. It is a public university. It is essentially the outgrowth of a merger of a liberal arts college, primarily taught teachers. And another——

Representative BROWN. When did they get into the sciences? How long ago?

Mr. FOLEY. About 7 years ago, and it was a very aggressive college president who said, "I am going to make this an engineering school because we don't need so many teachers up here any more."

We have enough of those schools. They are still teaching too many people to be teachers, but it took one president with the help of a couple of key people on our House and Senate Ways and Means Committees, who basically control what goes on in higher rank matters, I don't know about here, who said "we are going to make that a fine engineering school," talked about it, and has done it. It has been in existence 6 or 7 years. We get almost as many engineers from Lowell as we do from MIT.

Representative BROWN. My staff keeps telling me to stop, but how much money did you have to put into Lowell to get them to change?

Mr. FOLEY. I really don't know what the total is, but a number of our companies have been involved. The president of Data General, a graduate of Lowell, has probably put in close to $8 million or $10 million himself.

Representative BROWN. Out of what kind of a budget? Do you have a percentage of what it took to get that?

Mr. FOLEY. $10 million of his budget, probably close to 4 percent of his R. & D. is running——

Representative BROWN. I meant it the other way. How much of the University of Lowell's budget does that in fact take up?

Mr. FOLEY. It is probably 7, 8 percent.

Representative BROWN. Is it State or private?

Mr. FOLEY. State.

Representative BROWN. You did not run into resistance from AAUP thinking that you had tampered with academic rigidity?

Mr. FOLEY. We ran into that all the time. In a day or two, we would like to announce a major laboratory which could be shared by eight of our schools.

In drafting the authorization, we are running into union problems; an MIT student would have difficulty being taught by University of Massachusetts professors because of some contract, so we constantly run into this concept of industries coming in to take over the university and make robots out of kids.

We have real problems with tenure. We have real problems with the way funds have been appropriated in the past into other areas. So there are tremendous hurdles that have to be overcome, and we think we are upping the challenge, and we have developed a political base to get some action and we are not afraid to use that.

We think if we do the right job, the results will come.

Representative BROWN. Thank you very much. Gentlemen, thank you very much for your participation. We will go to our next panel and talk about money.

We will go to our next panel after a couple minutes for the benefit of the court reporter.

[A short recess was taken.]

Representative BROWN. Our next panel will be T. J. Dix, president of DX Financial, Inc., and Ralph Grieme, industrial consultant to the city of Cincinnati.

Mr. Dix, we will start with you.

STATEMENT OF T. J. DIX, PRESIDENT, DX FINANCIAL, INC., CINCINNATI, OHIO

Mr. DIX. Thank you for allowing me the opportunity to participate in this worthwhile function. Hopefully, the ideas and information developed here today will greatly assist and move forward the capital formation process in this area.

Since leaving commercial banking in 1978, I have been assisting from time to time, small emerging businesses in the acquisition of venture or other forms of expansion capital.

Some of my efforts in this regard have met with success, while others have not been so successful. It is from this hands-on perspective that I would like to share with the committee today some thoughts and observations regarding *the current and future status of* venture capital in the greater Cincinnati area.

First, let me clearly state that, in my opinion, there is no shortage of venture capital in this area or of venture capital that could be attracted to this area. The only thing that is in short supply, at this time, in the greater Cincinnati area is the right economic climate that will foster new enterprise; which, in turn, is the fountainhead of the real bottom line . . . jobs.

Capital is attracted to an area—not unlike metal shavings in a magnetic field—only if the recipient economic climate is both receptive and in balance. Throughout this discussion we will focus on the capital formation process for new and emerging small businesses. The successful larger companies in the area, such as P. & G., Federated, Kroger, et cetera, are well-managed and have direct access to the senior capital markets of the country. I share the concerns of a growing number of local citizens, that the local economy, notwithstanding the severity of the current national recession, is more fragile than we originally thought. In addition, it is temporarily out of synchronization. I will talk to this crucial point in more detail a bit later.

One of the most perplexing aspects of local venture or capital formation process is the frustration that a new or emerging small business owner often experiences when attempting to seek assistance, aid, or advice through normal channels. There are many financial assistance programs available in this and neighboring States that often go unused because of poor communications or the lack of interest or both.

In many cases, those who should know about such programs do not know or do not care. In the State of Ohio, under the Department of Economic and Community Development, there exists the Ohio Developmental Financing Commission (ODFC). The ODFC, with a small but excellent staff, has been providing significant creative financing throughout Ohio in the form of industrial development bonds, loan guarantees, and low interest direct loans. The No. 1 criterion of the ODFC in its financing activities is summed up as follows: Will the particular financial support of the ODFC retain or create new jobs. Similar programs are available in the Commonwealth of Kentucky through the development director's office. Both of these excellent resources could provide even more assistance in this area if there was better interface between the seeker of the financial assistance and the traditional sourcing contacts.

An actual case in point, is the recent experience of Thomas Janszen, president, Amity Unlimited, Inc., this city. Specifically, Janszen had to expand and wanted to stay in the city of Cincinnati. He received limited cooperation from the city and other normal sources; and, consequently, he is reluctantly relocating his firm—100 jobs—to the village of Lockland. Janszen estimates that in his new location as the result of the financial assistance provided by the ODFC and others, the firm will create an additional 150 new jobs over the next 3 years. While these jobs remained in Hamilton County, they will be forever lost to the city of Cincinnati. The loss of such jobs means the loss of tax revenues.

I mentioned earlier about the increased sense of concern about the economic health and vitality of this wonderful area we all call home. Since coming to Cincinnati in 1973, I have been a strong booster of the greater Cincinnati area—its ambiance—its excellent quality of life. Although quality of life is not a direct economic consideration, it does augment and support economic development. Recent disclosures from the 1980 census confirmed that all is not well in Cincinnati and the surrounding area. Stagnant or declining population statistics are ominous signs not to be ignored. They often signal decline of business activity and individual livelihoods if not fully understood and if corrective action is not initiated. What I am about to discuss is neither wishful thinking or doomsaying; but it is a call for all concerned parties to take stock of our local economic climate and develop a positive plan of action for the balance of this century.

The recent census revealed significant losses in population for the city of Cincinnati and growth in the related SMSA was flat for the preceding decade. Our experience during the same period was shared by Louisville and its SMSA.

On the other hand, Columbus, Knoxville, and Lexington experienced strong population growth in the seventies. Columbus not only grew in population, it was or has been selected as the headquarters city by several major national corporations. Officials in Columbus credit their experience to a rebirth of the entrepreneurial spirit—a spirit we in the Cincinnati area need to rekindle.

Over the years, Cincinnati has enjoyed excellent leadership in the areas of business, education, government, and labor. However, the leaders in these important components in the fabric of our economic climate have often tended to stick to their knitting in their respective bailiwicks.

Coequal cooperation in the wide range of problems that face a community such as this has been spasmodic and usually limited to the charitable arena. All of this must change if we are going to enjoy strong economic growth in the 1980's and 1990's. What is needed is unparalleled cooperation among government, business, labor and education leaders if we are going to create the type of economic climate that attracts venture capital, fosters new enterprise and creates jobs.

With respect to our economic climate, it's time to take stock and inventory of our strengths and weaknesses. It's back to blocking and tackling again. We need to evaluate the past and rethink the future. We have structural problems which are not even being dented by the traditional operating focus of current thinking. The local economic climate needs structural and strategic changes, not merely operational ones. We may be asking this community and its leaders to change a mind-set; but I am confident that it can and they can make the necessary changes with a style and flair only found in Cincinnati.

While there are no simple solutions, only difficult choices, to the revitalization of the local economic climate, I will leave this subcommittee with one positive recommendation for action.

Several months ago in a speech given in Cincinnati by Edward G. Harness, retired chairman of Procter & Gamble, a well reasoned plea was made for the eventual consideration of regional government for the tri-State area. Notwithstanding our historic provincialism, Harness

predicted that the needs of the future will demand a more effective and efficient local government delivery system in this area.

In line with Harness's logic and mindful of the many frustrations being faced by local enterpreneurs, I propose the formation of a Tri-State Economic Development Commission. The commission will be charged with the task of facilitating economic growth, venture capital and job creation in all parts of the Greater Cincinnati area. It would be autonomous of existing groups but will work closely with all groups in the region. Funding will come from local governmental units and, perhaps, the business community. A professional staff would be retained. The commission will be guided by an advisory group made up of all segments of the tri-State region.

Local economic growth can only be achieved by good planning, cooperation, hard work and pride, not from imagery or rhetoric. Thank you.

Representative BROWN. Thank you, Mr. Dix.

[The prepared statement of Mr. Dix, together with an attachment, follows:]

Prepared Statement of T. J. Dix

Cincinnati—Venture Capital or . . . ?

Thank you for allowing me the opportunity to participate in this worthwhile function. Hopefully, the ideas and information developed here today will greatly assist and move forward the capital formation process in this area.

Since leaving commercial banking in 1978, I have been assisting from time to time, small emerging businesses in the acquisition of venture or other forms of expansion capital. Some of my efforts in this regard have met with success, while others have not been so successful. It is from this hands-on perspective that I would like to share with the Committee today some thoughts and observations regarding the current and future status of venture capital in the Greater Cincinnati area.

First, let me clearly state that, in my opinion, there is no shortage of venture capital in this area or of venture capital that could (note I said could) be attracted to this area. The only thing that is in short supply, at this time, in the Greater Cincinnati area is the right economic climate that will foster new enterprise; which, in turn, is the fountainhead of the real bottomline ... JOBS!! Capital is attracted to an area (not unlike metal shavings in a magnetic field) only if the recipient economic climate is both receptive and in balance. Throughout this discussion we will focus on the capital formation process for new and emerging small businesses. The successful larger companies in the area (i.e. P&G, Federated, Kroger, etc.) are well managed and have direct access to the senior capital markets of the country. I share the concerns of a growing number of local citizens, that the local economy, notwithstanding the severity of the current national recession, is more fragile than we originally thought. In addition, it is temporarily out of synchronization. I will talk to this crucial point in more detail a bit later.

One of the most perplexing aspects the local venture or capital formation process is the frustration that a new or emerging small business owner often experiences when attempting to seek assistance, aid, or advice through normal channels (i.e. banks, Chamber of Commerce, governmental units, etc.). There are many financial assistance programs available in this and neighboring states that often go unused because of poor communications or the lack of interest or both. In many cases, those who should know about such programs do not know or do not care. In the State of Ohio, under the Department of Economic and Community Development, there exists the Ohio Developmental Financing Commissions (ODFC). The ODFC, with a small but excellent staff, has been providing significant creative financing throughout Ohio in the form of Industrial Development Bonds, loan guaranties and low interest direct loans. The number one criterion of the ODFC in its financing activities is summed up as follows ...

will the particular financial support of the ODFC retain or create new jobs (I currently serve on the Commission as Vice-Chairman). Similar programs are available in the Commonwealth of Kentucky through the Development Director's office. Both of these excellent resources could provide even more assistance in this area if there was better interface between the seeker of financial assistance and the traditional sourcing contacts. An actual case in point, is the recent experience of Thomas Janszen, President, Amity Unlimited, Inc., this City (see accompanying letter from Mr. Janszen). Specifically, Janszen had to expand and wanted to stay in the City of Cincinnati. He received limited cooperation from the City and other normal sources; and, consequently, he is relunctantly relocating his firm (100 jobs) to the Village of Lockland. Janszen estimates that in his new location as the result of the financial assistance provided by the ODFC and others, the firm will create an additional 150 new jobs over the next three years. While these jobs remained in Hamilton County they will be forever lost to the City of Cincinnati. The loss of such jobs means the loss of tax revenues.

I mentioned earlier about the increased sense of concern about the economic health and vitality of this wonderful area we all call home. Since coming to Cincinnati in 1973, I have been a strong booster of the Greater Cincinnati Area .... its ambiance - its excellent quality of life. Although quality of life is not a direct economic consideration, it does augment and support economic development. Recent disclosures from the 1980 Census confirmed that all is not well in Cincinnati and the surrounding area. Stagnant or declining population statistics are ominous signs not to be ignored. They often signal decline of business activity and individual livelihoods if not fully understood and if corrective action is not initiated. What I am about to discuss is neither wishful thinking or doomsaying; but it is a call for all concerned parties to take stock of our local economic climate and develop a positive plan of action for the balance of this century.

Let's stop briefly and review certain data gleaned from the 1980 Census. Population comparisons for Cincinnati and the surrounding region are as follows:

Classification	1970	1980	% Change
U.S.	203,302,031	226,504,825	+11.4%
U.S./SMSA*	153,693,767	169,405,018	+10.2%
U.S./Core Cities	67,850,229	67,930,334	+ .1%

Cincinnati/City	453,514	385,457	-15.0%
Cincinnati/SMSA	1,387,207	1,401,403	+ 1.0%
Columbus/City	540,025	564,871	+ 4.6%
Columbus/SMSA	1,017,847	1,093,292	+ 7.4%
Louisville/City	361,706	298,451	-17.5%
Louisville/SMSA	867,330	906,240	+ 4.5%
Indianapolis/City	736,85	700,807	- 4.9%
Indianapolis/SMSA	1,111,352	1,666,929	+ 5.0%
Knoxville/City	174,587	183,139	+ 4.9%
Knoxville/SMSA	409,409	476,517	+16.4%
Lexington/City	108,137	266,701	+88.8%
Lexington/SMSA	266,701	318,136	+19.3%

*Standard Metropolitan Statistical Areas.

Source (1980 Census)

The recent Census revealed significant losses in population for the City of Cincinnati (-15%) and growth in the related SMSA was flat (+1%) for the preceding decade. Our experience during the same period was shared by Louisville and its SMSA. On the otherhand, Columbus, Knoxville and Lexington experienced strong population growth in the 70's. Columbus not only grew in population, it was or has been selected as the headquarters city by several major national corporations. Officials in Columbus credit their experience to a rebirth of the entrepreneurial spirit. A spirit we in the Cincinnati area need to rekindle.

Over the years, Cincinnati has enjoyed excellent leadership in the areas of business, education, government and labor. However, the leaders in these important components in the fabric of our economic climate have often tended to stick to their knitting in their respective bailiwicks. Co-equal cooperation in the wide range of problems that face a community such as this has been spasmodic and usually limited to the charitable arena. All of this must change if we are going to enjoy strong economic growth in the 80's and 90's. What is needed is unparallel cooperation among government, business, labor and education leaders if we are going to create the type of economic climate that attracts venture capital, fosters new enterprize and creates jobs.

With respect to our economic climate, it's time to take stock and inventory of our strengths and weaknesses. It's back to blocking and tackling again. We need to evaluate the past and rethink the future. We have structural problems which are not even being dented by the traditional operating focus of current thinking. The local economic climate needs structural and strategic changes, not merely operational ones. We may be asking this community and its leaders to change a mind-set; but I am confident that it can and they can make the necessary changes with a style and flair only found in Cincinnati.

While there are no simple solutions, only difficult choices, to the revitalization of the local economic climate, I will leave this Commitee with one positive recommendation for action. Several months ago in a speech given in Cincinnati by Edward G. Harness, retired Chairman of Procter & Gamble, a well reasoned plea was made for the eventual consideration of regional goverment for the Tri-State area. Notwithstanding our historic provincialism, Harness predicted that the needs of the future will demand a more effective and efficient local governmental delivery system in this area. In line with Harness's logic and mindful of the many frustrations being faced by local entreprenuers, I propose the formation of a Tri-State Economic Development Commission. The Commission will be charged the task of facilitating economic growth, venture capital and job creation in all parts of the Greater Cincinnati Area (SMSA). It would be autonomous of existing gropus but will work closely with all groups in the region. Funding will come from local governmental units and, perhaps, the business community. A professional staff would be retained. The Commission will be guided by an Advisory Group made up of all segments of the Tri-State region.

Local economic growth can only be achieved by good planning, cooperation, hardwork and pride...not from imagery or rhetoric.

March 17, 1982

Mr. Tom Dix, President
DX Financial, Inc.
2327 Park Avenue
Cincinnati, Ohio 45206

Dear Tom:

Thank you for your assistance in finding financing for our building - especially in leading us to the ODFC and Richard Focht.

Being a small company with 100 employees is extremely frustrating to expand one's facilities. Since it is not an every-day or even an every five-year occurrence, just finding information about the availability of financing from various governments -- state, federal, county or city, is extremely time-consuming.

Since 1978 we have increased sales 55% and had reached the point where additional expansion was impossible without increasing our space. In our January 1981 planning meeting, a decision to expand was made, with a target for completion of the expansion, summer of 1982. Our first choice of expansion was to stay in our present facilities, renting additional space in this building. At a meeting with the owner, we were informed that we could not rent additional space, nor would we be able to renew our lease because of his business expansion into the 40,000 square feet we were presently using.

Knowing that we must move, we outlined our needs for space/location and set a dollar budget. Our space requirements were 60,000 square feet immediately, with a five-year growth to 100,000 square feet. Ideally, all space on one floor. As a direct mail business, our first choice of location was the Queensgate-Dalton Street Post Office area. With this location in mind, we developed a system of sections in circular boundaries, beginning at the downtown location and moving outward according to each circular section. We set our initial budget at $1,000,000.00, provided 12% maximum financing was available.

Amity Unlimited, Inc.
2314 Iowa Street, P.O. Box 6028, Cincinnati, Ohio 45206, (513) 221-1105
Amity's Unlimited Services: Mailing, Printing, Typesetting, Creative, Ad Response, Warehousing, Mail Lists

Our search started first with the Economic Development Department of the City of Cincinnati. We were informed that they knew of nothing available to meet our specifications, but if we would send them a letter, we could be put on a two or three year waiting list for property in Queensgate II.

We called the Chamber of Commerce who offered to go through their files of available buildings. We contacted five industrial realtors and spent the next seven months trudging through buildings in a 20-mile radius of Queensgate.

Through a per-chance meeting with the owner, we became aware of the property in Lockland, which consisted of nine plus acres, 97,000 square feet on one floor, 12,000 square feet of office space, 46,000 square feet of plant, 36,000 square feet of warehousing and 3,000 square feet of utility and docks.

After negotiating price, and ascertaining remodeling costs with our architects, we found it fit our budget.

We talked with our bank about conventional financing which was out of the question. We talked to another bank about IRB's and that rate by itself made the project marginal. By chance, I talked to Jack Schroeder, President of Weldco, Inc., and he mentioned he had received a loan from the state, which, combined with his IRB's, made his project feasible. After numerous phone calls, listening to such answers as, "The State wouldn't help," "Don't bother, too much red tape," "The State promises everything, but delivers nothing," or, most frequently, "Never heard of any State funding program," I reached you. From you I reached the ODFC and was pleasantly surprised. Sure, there were forms to fill out but most of the information was readily available in our office, and the ODFC staff was great to work with.

As you know, our loan has been approved, and we are now completing the balance of the financing with IRB's. We will complete this project.

But I do stop and wonder how many other companies have tried to expand but were stopped because of not being able to find someone like you who had the answers.

An aside to this is that every year a State Safety Inspector stops in our shop for an annual inspection. He offers all kinds of safety booklets, posters, calendars, pocket memo folders in any reasonable quantity. He discusses safety with me and our general manager and has even offered to put on clinics on our time schedule. But no one has stopped in to discuss how to expand.

In Hamilton County there are 26,000 plus businesses. There are 57 companies which employ over 1,000, 185 who employ between 251 and 999, and 303 between 101 and 250. From these figures you can easily ascertain that the economic development growth will come from the 25,000 plus smaller businesses, but not without someone telling them how.

You have been a major help to our expansion, Tom, and perhaps you can be the same to others my size or smaller, by letting the State Committees know of our problems.

Sincerely,

AMITY UNLIMITED, INC.

Thomas H. Janszen
President

THJ:dt

Representative BROWN. Our second witness is Ralph Grieme, industrial development consultant to the city of Cincinnati.

Please proceed, Mr. Grieme.

STATEMENT OF RALPH B. GRIEME, JR., INDUSTRIAL DEVELOPMENT CONSULTANT TO THE CITY OF CINCINNATI, OHIO

Mr. GRIEME. I was asked by the staff to participate as a catch person to try to fill any gaps that the previous speakers may have left.

I have to admit that following the presentation of the previous panel and Mr. Dix's presentation, there aren't many gaps left to fill.

The previous discussion, I think, hit many of the nails that are involved right on the head.

My background is that I have been involved in economic development activity as a private developer in the last 6 years as a consultant on economic development to the city of Cincinnati and also have been chairman of various agencies for the city of Cincinnati.

I bring a foot into the private sector and a foot into the government with respect to the commercialization. I think, if I may make a couple of random comments before going into the main comments, observations of the conversation today, I definitely reinforce the statement made by the previous panels, their appraisal of what the problem is, but I also would like to point out the communication problem that today people who should have heard the statements primarily were the university presidents, all of whom I think left following their presentation.

I would like to also emphasize that one of the problems that seems to be overlooked in our educational structure is that, as pointed out by Mr. Foley, it took an individual to cause something to happen in the MIT or the Boston high-tech regrowth experience, and the universities across the country tend to train people hired by industry as middle level executives to be trained and move up the ladder as opposed to training people to go out and start their own firms and their own businesses.

In many respects, the regulations and limitations placed on college professors and research people on universities create the spinoff that has been the avant-garde of the high-tech development around the university centers in other parts of the country.

I also have to indicate that I think the history would show that counseling for higher education for students going to higher education does have a lag behind the needs.

If I can remember the fifties, and my own counseling on campus was that you should be an aerospace engineer because of the growth of the space program.

Then everyone was pushed, humans, into the social service areas, and now, of course, the avant-garde of high technology, we are back telling people that engineering is the way to go.

I think those are some salient comments that I think address the fact that there was a basic need for the change in the mind, as Mr. Dix mentioned, not only in the business sector, but also in the educational sector of our community.

Specifically on some of the points that had been suggested in the letter from the staff, the past growth in the high-tech fields in the recent decades has been primarily internal to the industry.

Growth and new discoveries and the enhancement and the development of those discoveries in the areas of electronics, computerization, miniaturization communications, in doing some analysis of how the city of Cincinnati and the region might fit into that type of a growth in high-tech, we have been doing some studies and some analysis to determine how we can take advantage of that.

It has been pointed out to you by many sources, as I think several of the individuals early spoke to, that the new growth in high technology is going to be the application of the technological discoveries to date to the manufacturing of products, perhaps products that did not exist before in the case of robots, but perhaps a different way of manufacturing the traditional products we are used to seeing.

The city of Cincinnati, along with the Greater Cincinnati Chamber of Commerce, have cofunded a study by the Stanford Research Institute to do an evaluation of the city and its regional climate to take advantage of high-tech and the application period that is coming ahead.

As was stated by previous speakers, the basic analysis of that report I believe is going to show that the basic quality of life and profile is here. There is no reason from a locational standpoint that Cincinnati cannot be a growing industry in the high-tech era ahead, but what has been pointed out, and is being shown, is that there is a definite lack in the intrastructure of the educational structures in this area of the type of programs needed and the type of relationships desired by industries in these fields.

Also there is a lack of financial capability, as mentioned by Mr. Dix in his presentation, but what we are trying to access with this study is how this city can capitalize on this high-tech growth by taking its existing manufacturing base and creating languages to transfer the technology to save some of the industries that we have which, unlike Milacron, do not have 43 percent of their current product line only developed in the last 5 years.

Some of our older, more established firms, the backbone of our economy, are firms which have had products that they have been making over a much longer period of time, and if they do not modernize and do not produce new technology, they will eventually become dinosaurs of the industry.

In addition to having a lack of some of the programs that are needed in the institutions, especially at the university level, there is also a lack of promotion and awareness of some of the programs that we have had.

Some of the research programs mentioned by the university professors were little-known outside of their own circles.

The lack of entrepreneureal spinoff from the university and the lack of abundant venture capital are probably the most critical elements that we are going to be addressing.

Cincinnati has not traditionally been suffering from a flight of industry to sunbelts, as Mr. Dix mentioned with his example.

The traditional flight here is from the city to the suburbs which, on a regional basis, has a net effect on the region as a balance, but on the city as a net loss.

The major problem in Cincinnati, which is true of the northeast and midwest, is that the death of new companies exceeds the growth or institution of new companies and, consequently, the job deaths exceed job births.

A report by Dale Birch of MIT showed that in 1968 to 1976, over 800,000 jobs were added to the economy of the United States. Only 76,000 of those jobs were created by the efforts of the top 1,000 companies. The balance were developed by small and medium-sized business and the start-up of new businesses.

That study has been quoted many times, but one element of that study, which has not been quoted as often and is probably the most important point is that the study showed that no matter what you do, job deaths are about the same and company deaths are about the same whether you are in the Sun Belt, the Northeast, or the Midwest.

The significant difference is that the Northeast and Midwest lags in the creation of new companies and the creation of new jobs.

What is needed is State encouragement of established and expanding needs of university programs, of funding those—not cutting back and funding at that level.

The State has to also encourage more research oriented programs through foundations affiliated with universities, utilized and staffed in partnership with organized faculty-management.

They have to encourage more flexibility for faculty members to be entrepreneurs in their own right, using the technology and the development that they helped create.

Find a way of subsidizing the faculty cost as well as a way of producing new companies and new jobs for the local community.

I believe these needs would be true in other parts of Ohio as well as the city of Cincinnati.

What are we doing locally? We are currently preparing to support the implementation of the SRR Report, and we will be happy to supply a copy of that report to the committee when it is published. It should be available the first week of April.

The city itself has taken the lead in trying to encourage the development of a research foundation and research park closer to the university with the purchase of the Longview Hospital property, a former State mental institution of 100 plus acres, to create an embryonic effort in this regard closer to the university.

The interesting thing about this, of how the system works, is that the State was willing to give that acreage for local industry to talk about expanding some of its activities, but when it came time to have the city develop the property, we wound up paying $1¼ million to just acquire the rights to do so.

There is another problem I would like to bring to your attention, which is not so much discussed, and I do not think I heard it discussed completely this morning, there was some mention of the retraining of individuals because of the growth of robotics in industry.

I think we have to realize that in certain industries following the current economic downturn, many of the employees who have been laid off are not going to be called back regardless of modernization or not.

Changes in many aspects of the economy are going to be fixed in place which are not going to demand the same level of jobs; the automobile industry, obviously being one.

We are going to have a massive retraining program to take on in the next 6 to 8 years left in this decade. We already have a large pool of uneducated, untrained individuals.

That also has to be absorbed and tackled, but perhaps the saddest part of all is that there is a growing number of high school graduates who cannot come out of our institutions equipped to handle the basic skill levels that they need to handle in order to be trained for the jobs.

A recent news article in a Cincinnati newspaper quoting the military recruiting commands cited a study done by the Pentagon which shows that in both the private and public school systems, they are having greater and greater difficulty finding students who can pass the entrance level to the military, and even a greater problem in finding students who can pass the test to be chosen to be put into school to train for maintenance of the highly technical hardware which is being brought into the military.

This same phenomenon is occurring in the private sector as well, and it is not diminishing.

If we do not do something to address this problem, all the efforts we make at attacking the current unemployment problem are going to be for naught because we are going to be producing more and more people into the system than we can handle.

At the same time, this reduction of skill level seems to be occurring in our educational facilities in the secondary level. We have a growing industrial job demand that requires more and more technical skills.

You can look at the newspapers in any major city in their Sunday edition, wherever there is a major job hunting edition, and see an abundance of jobs for people, but even for those that do not require college degrees, the technical skill requirement eliminates many people from consideration.

Part of the problem is a poorly coordinated vocational education system in this area. I think State funding, a true understanding of the problem, is needed before that problem can be addressed.

The last item I would like to identify for the subcommittee, are laws or regulations that are influencing the development of the region. I have to point out that one of the major problems to development in the region is coming from the Federal level and from all agencies.

It has come from the Internal Revenue Service. I think we are all aware until last year's tax amendments there has not been a great deal of effort for economic expansion, but at the same time in relation to that expansion, some of the provisions of that tax amendment are going to encourage the flight of industry from the older cities instead of staying.

Acceleration and appreciation, I think, are going, if it continues—as opposed to staying and remodeling where they are at.

Probably the single most restricted item that creates this problem is that industrial revenue bonds, both before and since the recent promulgation of changes and regulations by the administration, eliminates the amount of money that a company can invest while it is increasing the amount of money it can invest somewhere else.

For example, the Kroger Co. wound up locating a research and development facility and 250 jobs from the city of Cincinnati to northern Kentucky because, under the currrent IRV limitations, it could not

fund any IRV's in Hamilton County, and the competition for that firm placed us out of the competition almost before it began.

I might also point out, Cincinnati Milacron some years ago built five satellite plants around Cincinnati to enter the plastics industry, manufacturing equipment. One of the reasons they chose not to do any of the expansion in Hamilton County was that they could not meet the capital funding limitations placed upon them by IRV bonds.

It forced them to take it to rural areas and other States. This has not been corrected, or corrected by you or the industrial revenue bonds or the proposal for enterprise zones.

The specific point of all, I think most important, is the restrictive annexation laws that are on the books because we basically have a suburban and rural dominated legislature.

Mr. Dix pointed out that Columbus has the profile of being a growing and expanding city. There is a report that has been prepared that shows that all cities in the Northeast and Midwest that have had the flexibility to expand their geographic boundaries are in either a growing posture or at least in a healthier posture than other cities in the Midwest who have not had the opportunity.

The specific company that Mr. Dix used, coincidently, Mr. Janszen at Amity Printing had a requirement for a building of 100,000 square feet and needed acreage to either build a new building or find an existing building.

Because of the densely developed nature of the city, there was not a suitable 100,000-square-foot building in the corporate limits and currently, right now, we cannot put together a 10-acre site for any industry that wants to locate in the city from outside or to retain a company that we have.

We subsequently lost a company called Bushman Conveyor to Northern Kentucky for that very reason, amongst others, but primarily site restrictions, a major cause, and we are soon going to lose another company, which I cannot name because they have not announced it, of 350 employees who are also moving because of an opportunity that existed that they could not find within the corporate limits of the city of Cincinnati.

I think a major emphasis has to be made for State funding for university and for education and for the research foundations and parts affiliated with universities or the university foundations, but I think there also has to be some major change in finding some ways that the cities can find some geographic area in which to create some development to cause some way to increase their tax base and support the infrastructure which is necessary to keep our central cities great.

I think also that the Federal limitations on industrial revenue bonds have to be changed and structured in such a way that they favor retention.

Perhaps industrial revenue bonds should not be available for a company that is moving out of a depressed area into another area or at least perhaps the amount of funding available should be greater where they are as opposed to moving someplace else.

Last, but not least, I think the State of Ohio, as well as most States, spends too much time chasing industries instead of concentrating on retention and modernization and expansion of plants that we have,

assisting in the transfer of technology and retooling of plants and the retraining or training of our residents.

I hope that covered some of the gaps that were in the previous presentation and, again, I will be willing to submit some written material on that.

Representative BROWN. Thank you very much for your testimony. You have certainly stimulated us with some good thoughts and, particularly the last one, which I think is one of the criticisms that should be made of this State and perhaps all States in terms of their effort at industrial development. Retention, growth, and service to small industries are not necessarily high on their list.

It is the big businesses that seem to be stolen from some other location that are the primary objective and how that may pay off today. It seems it is also quite costly in an economic sense around the country.

Mr. Dix, at the Federal level, the 1981 tax cuts reduced the tax on capital gains. Do you think that is going to have a significant effect on the venture capital market?

I understand, of course, the recession clouds that situation at present, but I am asking for sort of an economic judgment, I guess, of whether or not the capital gains changes were sufficiently stimulating to venture capital types of personalities?

Mr. DIX. I think capital gains will have a benefit after we all get out of this psychological impasse with the recession. I do not think it has been given a fair test.

Representative BROWN. What other changes would you recommend that might stimulate the development of venture capital? That is what we are really talking about in this hearing, and the prospect of a venture capitalist being able both to aggregate the funds and the courage to invest them in a high risk business.

Mr. DIX. It is quite interesting that if you go back in the history of your city, venture capital was in many cases conducted by some very strong commercial bankers who were not restricted by the regulatory climate as far as charge-offs and the way loans are handled.

They also dealt into the backgrounds of people who believed in them. The commercial banking community, while it is an independent venture field, can no longer take a flier, so to speak. I would call it the Bert Lance syndrome.

Representative BROWN. You are anticipating my next question. That is: What Ohio or national laws or local restrictions, if any, are impacting the banking and the venture capital business in a negative way that discourages the assistance to small business?

Mr. DIX. Well, as I mentioned, I don't believe there is a shortage of capital. I think you have to get back to what the previous gentlemen were talking about which was the educational base of what is the fabric of the economic climate within that community.

Representative BROWN. You are drifting off from my question. Can you give us maybe some specific legislative or regulatory limitations on the venture capital market by State or Federal Government that discouraged commercial banks from providing venture capital opportunity.

Mr. DIX. Well, specifically in commercial banks, as a result of the changes after the Bert Lance affair, which was a very localized thing.

there was a severe restriction made on the banks on how they could handle loans. There are occasions when you are in the banking business that you will work with a client in bringing back to health—what with the new regulatory climate and how it changes, a banker really has no leeway and no alternative.

He has to write down and charge off, which really affects his capacity as his actual capacity to work within his community.

You go back, you know, their hands are tied. In a lot of small communities, it is really the commercial banker who understands the background of that entrepreneur and really knows where he has been and where he is going and is willing to make a character loan because there is no security that is going to work with that person.

Representative BROWN. Is interstate banking going to be the answer to that problem?

Mr. DIX. I do not know whether it is going to be the answer, but we are going to have it. It seems like it is inevitable.

Representative BROWN. Does it contribute anything, though, to that problem?

Mr. DIX. I do not think so. I happen to feel that one of the best bankers is a little banker, Cliff Cores, and you cannot touch what he does with his clientele, but he is in his office at 9 every Friday night. I think that is going to change.

Representative BROWN. He is not going to get arrested, is he?

Mr. DIX. He runs the best bank in the State of Ohio, as a matter of fact, as far as the statistics and bottom line. He knows his market, and he knows his clientele, and he is there to service them.

Representative BROWN. You seem to be making an argument against interstate banking with that example.

Mr. DIX. I am afraid that we are going to become very impersonalized. Banking is still a one-on-one business.

Representative BROWN. Ohio bankers are by two or three points more conservative in their investment policies than bankers in the country at large.

I relate that, whether properly or not, to the fact that they had been associated in the State with some of the largest U.S. corporations: General Motors, Chrysler, International Harvester, and United States Steel. When you have those blue chip companies in your community, you tend to be conservative with reference to your investment portfolio.

Now, some of those blue chip companies have turned red, and the bankers seem to be putting the money into Federal Treasury investment and, therefore, qualify them at more conservative modes.

Do you see any reason particularly why Ohio bankers would be more conservative than other bankers if conservative is the right word? I pick a political word which is maybe not appropriate.

Mr. DIX. There is an old saying in banking, you either sleep well or eat well, and you can't have it both ways, depending on how you invest your money.

I have been told by a banker that he never wrote off a loan. It is all in T bills. You find somebody who is willing to work, whether it is a bank or savings and loan, and really understands his community and works with that community, he is going to do some good.

You can go upstate Ohio and go into a town. You can feel the vibrations, and there is a good banker somewhere in that town.

You can go into some towns where they might as well roll up the streets, and that banker is putting all his money into T bills.

Representative BROWN. Ohio, and I think some few, very few other States' tax investment capital and return on investment by the intangible property tax; does that discourage venture capital?

Mr. DIX. No, that is so insignificant compared to the whole I don't really believe it is a factor.

Representative BROWN. Any other arrangements that you think discourage venture capital?

Mr. DIX. You know, venture capital, again, it is not a question of prohibitions or inhibiting factors, in my opinion, I think, if you have the opportunities, vis-a-vis, the educational background.

In this community, we are paying a price of being in a State that does not respect its higher education and will not fund it. I mean, as citizens, not the State government, we are in a community that has rejected millages time and time again, and just barely passed one.

We are paying the price now of not having the educational product and the R. & D. coming out of the universities.

I think the gentleman again who were here before brought that up very clearly. I think it is a combination of many things that we are dealing with, and there is no quick solution.

Representative BROWN. Let me stick to the banking questions just for one more minute.

Mr. DIX. You are going to make me very unpopular with my banking friends.

Representative BROWN. That is, do the restrictions placed on banking by the Federal Government and whatever State limitations there are—do those restrictions on the banking profession that have made it not responsive to the need for venture capital create, then, other venture capital organizations as a result?

Mr. DIX. I think, if I may, we drifted into commercial banks really. Venture capital is not necessarily the arena, but commercial banks can properly operate it.

When I think of venture capital, I think of when you and I get together and put some money together in a business. We are willing to accept the risk of failure—the limitation of our investment.

In many cases——

Representative BROWN. That is the venture part, but there is a need also for support for small business occasionally as noted by Mr. Farrell in his testimony about the business that begins to flow and suddenly has a capital need that the banker looks at and thinks is a little too extreme.

Mr. DIX. Again, that banker can take that customer by the hand to another, larger bank in another city and together they can handle his needs.

Now, that was done in this city 20 years ago. People I never met, Trimble Smith, like legends in the banking business in this city, and they did some fairly unique things that, for many reasons, are not directly involved with the individuals who are running the banks in this city, cannot do, but they made a lot of businesses what they are today because they backed a lot of people, and they backed ideas.

Representative BROWN. Some States, like Connecticut, have developed corporations to fund R. & D. When the product is commercialized, the State receives a royalty, negotiated usually, but averaging about 5 percent of sales for a stated period of time.

Do you think Ohio ought to consider that kind of program to expand high technology production?

Mr. DIX. I think Ohio should pick the best of all the good programs around the country. That is a good program, and the gentleman from Massachusetts, some of his ideas were very pertinent to what we have to do in this State.

We still have a lot of wealth and a lot of brain power. It just needs to be reassembled in a more effective package.

Representative BROWN. The British have a program called the National Research and Development Corporation in which they do something very similar to Connecticut's approach, and, in fact, it was run by the same person at one time in which they also fund new ideas and technical ventures.

Do you see a benefit in that?

Mr. DIX. Again, if it is well thought out and it is going to redirect the investment to where it should be to create jobs and enterprises in the State, yes.

For example, the State of Ohio went to and used a program developed in the State of Pennsylvania in a direct loan where we are in the direct 2 and 3 percent long-term loan business on the second mortgage basis behind either industrial revenue bond or bank financing, and spent a lot of time in slowly implementing that program and now it is really a very effective program.

But it was in effect plagiarized from another State. There is nothing wrong with that sort of activity. We are playing catchup baseball.

We have to pick the best brains around the country and pick and choose those programs.

Representative BROWN. Mr. Grieme, you mentioned a problem of the industrial revenue bonds being directed or being used to encourage expansion to other locations rather than expansion within the current location.

Have you found that to be an issue?

Mr. GRIEME. That is a very strong issue, but we are right in the middle of a strong controversy of revenue bonds, particularly in Congress.

There are many occasions where the $10 million limitation or the $20 million limitation, if there happens to be one, is supplied around the State as supplied in this area.

There ought to be some dispensation for companies who are willing to stay in the area and maintain the employment.

If this is the best route to go, they should be granted no items as far as implementation.

I firmly believe in industrial revenue bonds. Most people believe it is Government money. It is not. It is private capital being directed in the form and through a channel that is approved by a local agency or a State agency.

If it was not for this State, if it was not for best revenue bond financing during this long period of high interest rates, we would not

have the activity and construction and industry that we have now, as little as it may appear.

Representative BROWN. It has been suggested that the industrial revenue bond concept might be expanded to assist in the financing of higher education facilities, that is, the laboratory equipment that was mentioned by the presidents of the universities, or might even be used to finance higher education student loans.

Mr. DIX. I am certainly, with a son in dental school at Ohio State, I am all for student loans, so you are not going to get any conflict from me on that.

I think that is a very vital program as it interfaces with what was said here today. Somehow we have to subsidize the qualified student going through higher education facilities in this and other States.

Notwithstanding some of the business that we read about, yes, if it can help in these R. & D. laboratories, if this is a way that we can channel capital for these facilities, yes, let's use it.

Representative BROWN. Both you and Mr. Grieme mentioned the limit of growth in a city surrounded by suburbs and that the growth seemed to be in the communities that were not surrounded by suburbs, those communities that have the opportunity to expand their city limits.

Is that the real case, or is it the "new cities" which seem to be the same? They have not grown around, or is it the price of real estate in the larger cities where this impact comes?

Is it really municipal regulation or is it the limitation of the price of real estate or do the new communities literally have more room, less concentrated development?

Mr. GRIEME. Whether it is a new community or old community, it has no room. That's the point. There is no economic base to work from. What we have right now——

Representative BROWN. Let me ask you: In many major metropolitan communities, some of the older communities, they have been benefited by urban renewal and look like they are bombed out.

Mr. GRIEME. Cincinnati has not only benefited from that, but we are one of the successes. We took——

Representative BROWN. I am trying to get to the spacing.

Mr. GRIEME. You can take a limited, fine item out of space and recycle it, but you do not create additional growth because there is a limit to what you can put into it.

In addition to that, the trend today for the creation of jobs is more and more space, not less and less space.

For every job that you create—years ago, there was a company down here that makes children's clothing, has 400 employees. That is an extreme example, but that kind of concentration is an old tradition.

Now it is 5,100 square feet, 100 to 300 employees with room to expand and the acreage-employee ratio is just totally in the other direction.

In addition to that, even with modernization, the square footage of floor space per employee has increased dramatically, not only in warehousing and manufacturing, but in office space.

The consequences of that are that if a city has a finite boundary and if at one time you had all the industry that existed in its region,

it will not, as those plants modernize and expand, be able to keep its industry.

Then the population shifts to get the jobs, and the cycle repeats itself in some other location.

Representative BROWN. Mr. Dix suggested that the response to that was, quoting Ed Harness again—we should have asked him to the hearing—was to reorganize the political structure of those communities so that you could have regional government or absorption of the suburbs, I guess, if you lived in the suburbs.

That would be an argument that you could make. You could have some kind of economic unification of the area in such a way that your needed infrastructure requirements are met with the financing coming from the growth areas.

Mr. GRIEME. If you adopt a program, a fiscal disparity, the sharing of the tax base, if you will, that type of system could work whether you coordinate, consolidate the cities and counties or not.

The fact of the matter is that at political rallies we don't have that, and we have a suburban and rural dominated legislature which is not likely to supply the tax growth back to the cities, but currently there is movement in Ohio to demand that half of the earnings tax generated in Ohio's four cities be returned to the suburbs as well.

I mean, the attitudinal problem, not only in Ohio, but we are using that as an example. The Midwest and Northeast about tax sharing and Government is fractionalized and the result is we are not going to have that in a short period of time.

I think actually Mr. Harness was not calling for reorganization of governmental structure, recognizing the fact that it is not working very well to promote the three State-area on an individual basis, that there should be a reasonable development afforded or mechanism, whatever you want to call it, that would carry out that function.

That does not really address the problem of population decline, decline of infrastructure, decline of the modernization of the age of plants and equipment. Again, there has been a study.

Representative BROWN. Let me——

Mr. GRIEME. It has been in the area where there has been geographic growth, and the city has not only grown because of the ability to expand, but they have real growth, population increase and economic increase.

Representative BROWN. Let me suggest my personal experience recently with a situation where there was a regional planning organization in which 28 different localities were involved and 27 of them voted for the undertaking of an interstate highway system, and one city voted no, and they took it to the Federal Government and killed it.

Mr. GRIEME. That's right.

Representative BROWN. How do you accomplish that kind of cooperation because they wanted the highway in another area besides their poor city?

Mr. GRIEME. Unfortunately, what happened—the administration adopted regulations that allowed them to do that. They should not have had the power in the first place.

If a city determined that they did not want something to happen, then the director of the highway administration would have to be opposed to it.

It was a great care on the putout there. It sounds like a good idea. I think the people who did that are now saying, "I wish we hadn't."

It is the only city I know in the country that did that. It was a very televised thing. The problem isn't so much the type of conflict of one city holding another one back. That problem can be handled through communication and discussion, but when you talk about trying to have growth that is shared by everyone, you are talking about attitudes, and that is a different issue.

There is a theory that the rising tide raises all boats. I think we are finding this is unnecessarily true, but economic development goes back to what was being said earlier in the earlier group which was repeated here by Mr. Dix and that is that you have got to have the information of those new and small companies.

Cities can prosper from that because the traditional role of the poor city going all the way back to the early history of our country has been that incubation role, the place where there is an abundance of available low-cost space, the immediate need for access to resources and support elements, whether it be the printing industry or banking industry or communications industry.

It is only when a company grows to a certain size, that's called medium sized, that it can afford to take on some of those burdens internally and move on further out toward the suburbs and carry out its activities and continue to grow.

That incubation role is being stifled now because of two things. It is almost a chicken and egg situation. One, we have a lack of entrepreneurs, and, two, we have a lack of capital to fund those entrepreneurs. The question is——

Representative BROWN. Mr. Dix would argue with the lack of capital, would you not?

Mr. DIX. Yes, I would, but I will agree to the point.

Mr. GRIEME. The problem is not that we necessarily have a lack of money. We have a lack of money here that is being utilized here.

There has been a report done by the institute for a study of contemporary urban problems, part of Ohio State, that showed in the late seventies, 53 percent of the investment capital invested by Ohioans went to the Sunbelt.

You could say there was an abundance of entrepreneurs down there that wanted the capital.

On the other hand, you could have said they could have used that capital to attract some entrepreneurs here.

It goes back to part of the problem that our universities are not producing the entrepreneurs, the entrepreneurial spirit, or our whole educational system isn't.

Representative BROWN. I am not sure you can blame it on the educational system. It seems to me the tax system has a little bit to do with it also.

Mr. GRIEME. If a man has a good job and he is willing to work, he will find some way to make it happen. There are people that are going to be stifled, but by and large there are ways to make it happen.

The trouble is we make it so difficult that we are losing too many.

Representative BROWN. Mr. Dix, do you want to comment?

Mr. DIX. Somebody once said that the only way to get venture capital is to marry it, inherit it, or steal it.

Representative BROWN. You can pay a high interest rate on it too. I had one suggestion a couple years ago when we were looking at the change in depreciation rates, and that was that we ought to let the company that's starting out to write its own depreciation rate so you have the depreciation in the first 7 years of the company's life so that as the company's profits vary, you could write off your profits in 1 year and pay——

Mr. DIX. I totally agree with you. That makes so much sense.

Representative BROWN. Would that help us stimulate new companies?

Mr. DIX. It could simplify things. They could spread it equally over 7 years. It is basically a management decision.

Your comment earlier about the investment tax credit from big companies, I think that was a great program. I do not think it was totally thought out in Congress because so many things were happening all at once as far as taxes go.

I think the economic impact of some of these companies being able to utilize and others not being able to utilize it was carefully evaluated, and I think it is now easy to say: Why can some of the well-healed corporations take advantage of this when really it was intended to help the capital formation process?

Representative BROWN. You have both raised the question of municipal organization which is really, I guess, not within the realm of this subcommittee's jurisdiction, although it is within an area of personal interest that I have and maybe somewhere along the line someone needs to have a hearing on that problem.

I do appreciate your comments on venture capital. It has been a very good hearing for a number of different points, and within it are the kernels of perhaps, not only good ideas, but who knows, maybe even solutions to some of the problems which we have and that is what we are after.

Thank you very much.

The subcommittee is adjourned.

[Whereupon, at 12:55 p.m., the subcommittee adjourned, subject to the call of the Chair.]

[The following information was subsequently supplied for the record:]

STATEMENT OF WALTER R. MURRAY, JR., ASSISTANT TO THE PRESIDENT, CINCINNATI TECHNICAL COLLEGE, CINCINNATI, OHIO

Thank you Congressman Brown for the opportunity to provide a statement to be included with testimony from your hearing here in Cincinnati on the need to develop high technology industries in the Greater Cincinnati and tri-state area. As was stated in our letter to you, we congratulate your efforts to generate public discussion on this most important topic and the role of higher education in the overall economic development of the area.

In many respects Cincinnati Technical College is a model institution for purposes of highlighting the joint partnership between higher education and business and industry which you sought to encourage. In its short sixteen (16) year history, the College has produced over forty-five hundred (4,500) technicians in the business, engineering, and health fields. Each of its fifty (50) technology programs maintains an active advisory committee consisting of managers, supervisors, and chief executives who review and modify curricula and program

standards to ensure high academic quality and relevance to current needs in the job market. Over seven hundred (700) companies, from the Procter and Gamble Company to owner-operated job shops, participate in our cooperative education program providing more than 90 percent of our students with direct work experience in their fields of study prior to graduation. In addition to our full-time enrollment of over four thousand (4,000) students, thousands of adults enroll each year in our continuing education programs, apprentice programs, and technical skills improvement programs to update and improve their knowledge of the latest technological developments. Contrary to the charge of being unresponsive to the needs of area businesses and industries which was leveled at several local universities, it is our exclusive mission to meet these needs and our record of corporate support is a testimony to our success in meeting this mission. However, there are obstacles and trends which will potentially reduce our effectiveness and our ability to meet new challenges.

There are two major factors which, in our view, have the greatest potential to adversely affect the ability of Cincinnati Technical College to provide technicians for Cincinnati area businesses and industries in the next two decades. The first factor is the declining number of students electing to prepare for technical careers. The effect of this trend will be multiplied by the projected decline in the overall number of high school graduates over the next two decades. The second factor is the declining level of state subsidy for higher education in Ohio. Reductions in federal funding for vocational and technical programs will also increase the adverse financial impact. Together, these trends, if not abated, will result in a significant reduction in services to business and industry by colleges and universities as well as a decline in the number of technicians graduated from our business, health, and engineering programs.

PROJECTED DECLINE OF HIGH SCHOOL GRADUATES AND ENROLLMENTS IN TECHNICAL PROGRAMS

An analysis of demographic projections, state-wide trends in the number of annual graduates of technical education programs at community and technical colleges, and the technological development in industry points to a critical shortage of technically trained manpower in Hamilton County during the Eighties and Nineties.

Part of the problem is due to the projected shortage of high school graduates in Hamilton County, elsewhere in the state, and in the nation. The low birth rate in the 1960s and 1970s and Ohio's out-migration patterns in the Seventies have contributed to this phenomenon.

The annual decrease of high school graduates in Hamilton County will be nearly 1,500 in 1981, 3,000 in 1985, 5,000 in 1990, and 6,000 in 1993. Over the next fourteen years, the rate of decline in area high school graduates will increase from 7.4 percent in 1980 to 23.1 percent in 1985 and to 41.3 percent in 1993.

As the supply of Hamilton County high school graduates diminishes over the next fourteen or more years, the projections of employment in the Cincinnati Standard Metropolitan Statistical Area reflect an increase in manpower demands to 1985. Hamilton County will need a 32.2 percent employment growth for engineers and science technicians and a 48.4 percent growth for health technicians between 1974 and 1985. Both percentages reflect more than double the 16.2 percent total employment growth for all occupations in the county.

Despite the projected growth in technical areas of employment, the annual rate of growth in student enrollments in technical programs was only 1.4 percent in 1978 as opposed to 12 percent in 1976 and 22.9 percent in 1972. These data indicate the need to attract a higher percentage of the declining pool of high school graduates to technical careers and to retrain those individuals who are currently underemployed or employed in jobs for which there is a declining demand.

A significant effort of technical career orientation and funding targeted for retraining adults and attracting high school graduates will be needed to address this complex problem. However, current patterns of funding for vocational and technical education do not encourage innovative solutions to these problems.

DECLINING FINANCIAL SUPPORT FOR TECHNICAL EDUCATION AND JOB TRAINING PROGRAMS

Hampered by its own cash flow and the soaring cost of social programs, the State has not kept pace with either inflation or the absolute increase in fundable full-time equivalent students in its allocations for higher education. Over the past five years Cincinnati Technical College has received average increases in state subsidy of thirteen percent to meet increases in general operating expenses. However, even with these increases, the College has been underfunded by more than $1 million for students enrolled based on the state's reimbursement formula. In short, the College has been training more students than it has received funds with which to do this. Additionally, during this biennium, Cincinnati Technical College has been required on two occasions to operate at a reduced level of subsidy from what was originally allocated for as long as eight months in order to accommodate cash flow problems experienced by the State.

To keep up with the lagging rate of state subsidy reimbursements the College has been forced to turn to its only other major revenue source—student tuition and fee charges. In 1977, tuition and fees represented only twenty-five percent of total College income. For the 1981–82 fiscal year thirty-nine percent of total College income will be received through student tuition and fees. Given the historic mission of Ohio's two-year colleges to provide access to a wide range of citizens from various socioeconomic, ethnic and age groups, it is a desirable goal to maintain tuition rates at a level affordable to those with limited incomes. While Cincinnati Technical College has one of the lowest tuition rates in the area, continued shortfalls in state subsidy will result in a continued climb in student charges. Reductions in federal grant and loan programs will further complicate the issue.

Cincinnati Technical College currently receives five hundred thousand dollars ($500,000) from federal vocational education funds passed through the Ohio Department of Education. However, we are constantly being warned of a cutback in this funding which accounts for 7 percent of our total budget.

In summary, while the goal of Representative Brown's hearings was to encourage more and better preparation of technical and scientific manpower for economic development, the reality for the foreseeable future in Ohio may be a struggle for higher education in general and specifically for small, higher specialized institutions like Cincinnati Technical College to maintain the status quo in terms of service and productivity.

We would make the following recommendations for your consideration as your agency and the Congress consider solutions to the national technical and scientific manpower shortage:

(1) Provide national scholarships and incentive grants to high school graduates and adults to pursue technical and scientific careers. While the private sector and state governments as well must also provide some of these incentives, there must be significant national attention given to this problem.

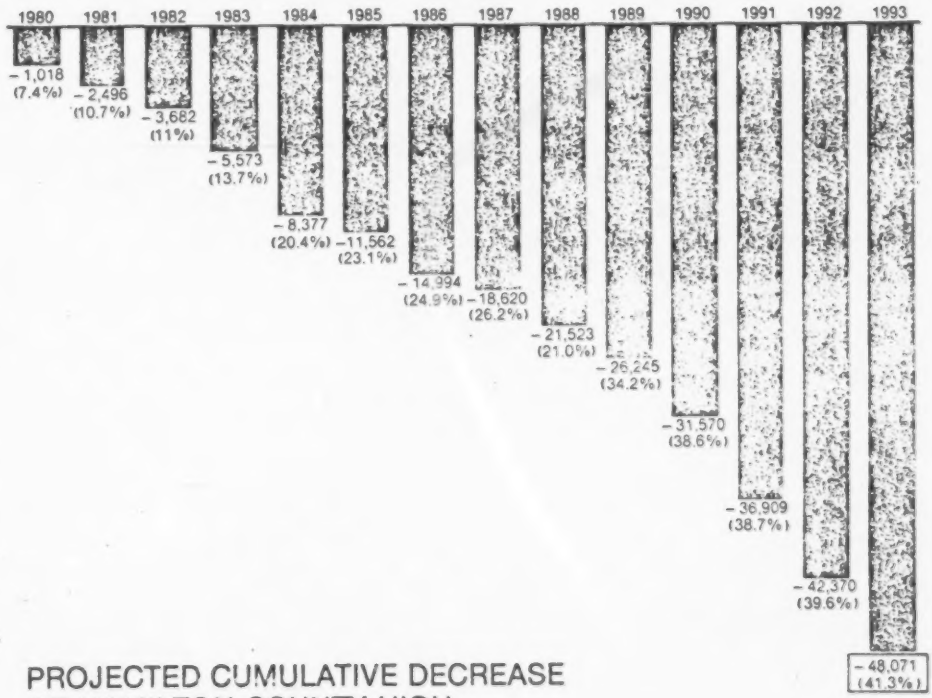
(2) Provide additional incentives for institutions of higher education and the private sector to cooperate in the conduct of research and development and in the design and implementation of manpower training programs.

While we have not attempted to go into further detail in this presentation as to how these objectives might be accomplished, you have a standing invitation to consult with us or involve us in any subsequent discussions concerning the role of technical education in the development of approaches which will address these issues. Such a dialogue would seem to be particularly appropriate at this time given the national interests which could be served, both in terms of the relevance of technical education to the need for strengthening national defense capabilities and for the improvement of business/industrial productivity.

Thank you once again for this opportunity to contribute testimony to this most important effort sponsored by you and the Joint Economic Committee.

° 40% Decrease in Hamilton County High School Graduates by 1993. . . 50,000 fewer persons to employ as technicians.

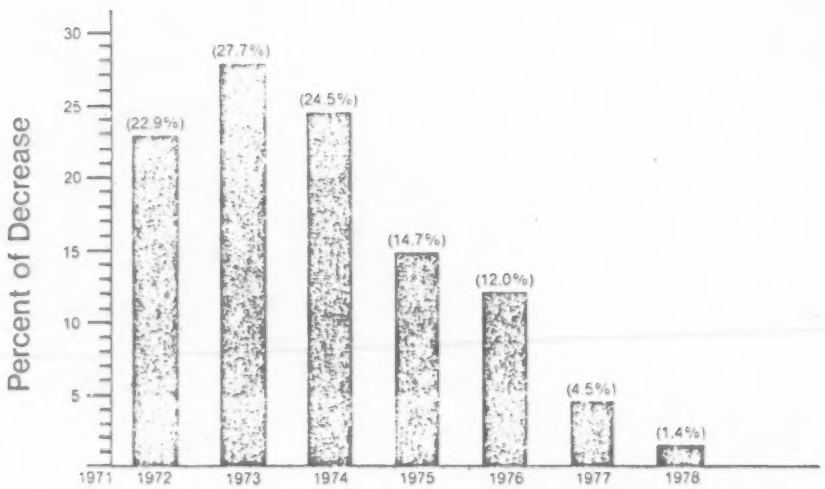
Base Year 1979 — 13,798 Graduates

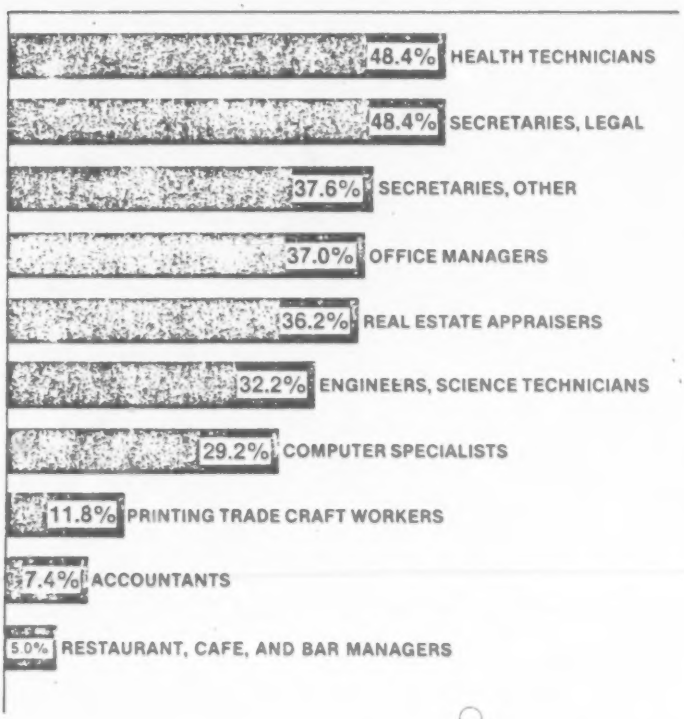


PROJECTED CUMULATIVE DECREASE OF HAMILTON COUNTY HIGH SCHOOL GRADUATES FROM 1979 to 1993, IN COMPARISON TO NUMBER OF 1979 GRADUATES.

◦Yearly Decrease in Technical Student Enrollment Growth Trend in Two-Year Colleges.

Base Year 1971 — 2,421 Graduates



• The need for technicians will increase. . .

Total Employment Growth in All Industries: 16.3%
from 1974 to 1985